PROCEEDINGS

OF THE

Academy of Natural Sciences

OF

PHILADELPHIA.

1894.

PART III, OCTOBER–DECEMBER.

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PHILADELPHIA:
ACADEMY OF NATURAL SCIENCES,
LOGAN SQUARE.
1894.

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ACADEMY OF NATURAL SCIENCES

OF PHILADELPHIA.

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Application to be made to EDWARD J. NOLAN, M. D., at the Hall of the Academy, Logan Square.

January, 1895.

OCTOBER 2.

MR. CHARLES MORRIS in the Chair.

Fifty-four persons present.

A paper entitled "A proposed Classification of the Fossorial Hymenoptera of North America," by William J. Fox, was presented for publication.

OCTOBER 9.

MR. USELMA C. SMITH in the Chair.

Thirty-two persons present.

The deaths of Joseph Hyrtl and Oliver Wendell Holmes, M.D., correspondents, were announced.

A paper entitled "A Study of the Systematic and Geographical Distribution of the Decapod Family Atyidæ Kingsley," by Dr. A. Ortmann, was presented for publication.

OCTOBER 16.

MR. CHARLES P. PEROT in the Chair.

Sixty-six persons present.

A paper entitled "New Species of Fungi from various Localities," by J. B. Ellis and B. M. Everhart, was presented for publication.

Diachæa Thomasii REX.—DR. GEO. A. REX presented specimens of *Diachæa Thomasii*, a species of Myxomycetes recently described by him, and commented upon the variations of the species and its relations to the adjoining genera.

The specimens differed in some respects from the original specimens from which the diagnostic description had been drawn, making it advisable to supplement that description.

The new specimens were a part of some recent gatherings made by Mr. Lancaster Thomas at the original locality for the species at Cranberry, N. C., in July and August of this year.

The sporangia of the type specimens were frequently grouped in clusters, but with rare exceptions they grew upon separate stipes.

This One
GHHJ-QKB-78XJ

In the recent gatherings, however, the sporangia show a remarkable tendency to aggregation into clumps of from twelve to twenty, the stipes growing together to form a thick compound stipe surmounted by the densely clustered sporangia. In some cases these are distorted by crowding, having their adjoining walls grown together, constituting stipitate æthalia.

The clustered sporangia have usually a purplish metallic lustre rather than the silver or bronze lustre of the single forms.

The capillitium differs from the type only in the presence of an extraordinary number of small dark-violet colored bulbous thickenings occurring upon the threads in their course, similar to those found in the capillitium of certain species of *Didymium* and *Chondrioderma*. These thickenings are ellipsoidal, turbinate or conical in shape and occur more frequently near the ends of the threads.

The speaker thought that these peculiar thickenings were of special interest on account of their bearing upon the relative position of the genus *Diachæa* in the systematic classification of the Myxomycetes. As they are almost exclusively found in certain species of the Didymiaceæ and the single species of the genus *Spumaria*, this species at least, of the genus *Diachæa* would seem to be connected with the Calcareæ by good structural characters other than the mere existence of granules of lime in the stipes and columellas of the sporangia.

The bulbous thickenings were also found in the capillitium of the type specimens but not conspicuously, or to a greater extent than they are sometimes found in the other species of *Diachæa*.

The speaker concluded that the genus *Diachæa* was properly associated with the Order Didymiaceæ (including the genus *Spumaria*) notwithstanding its points of resemblance to the genus *Lamproderma* suggesting its possibly closer relationship to the Order Stemonitaceæ.

The differences between the present gatherings and the former ones were probably due to climatic causes, the excessive rainfall and great atmospheric humidity prevailing in the North Carolina mountains during July and the early part of August of the present year, causing an exuberant development of plasmodium which resulted in a growth of unusually aggregated and æthalioid forms

October 23.

Dr. C. N. Peirce in the Chair.

Twenty-five persons present.

A paper entitled "Notes on the Mammals of Monroe and Pike Counties, Pennsylvania," by Samuel N. Rhoads, was presented for publication.

The death of F. Oden Horstmann, a member, was announced.

OCTOBER 30.

MR. CHARLES P. PEROT in the Chair.

Thirty-three persons present.

The death of William R. Lejee, a member, was announced.

A paper entitled "On a Collection of Batrachia and Reptilia from the Island of Hawaii," by Edw. D. Cope, was presented for publication.

Mr. Horace Binder was elected a member.

The following were ordered to be printed:—

A PROPOSED CLASSIFICATION OF THE FOSSORIAL HYMENOPTERA OF NORTH AMERICA.

BY WILLIAM J. FOX.

The arrangement of our Fossores contained in the following pages, I trust will be of some service to students of these insects. It has been evident for some time that the existing arrangement, that contained in Cresson's Synopsis,[1] is of little value, as it is too superficial. Entirely too many families, without characters to substantiate them, were recognized: the Sphegidæ, for instance, which were divided into no less than nine families. Accepting these nine families would, it seems to me, necessitate the erection of families for such genera as *Neolarra, Bothynostethus, Trypoxylon* and others, which stand more or less isolated and yet possess characters which connect them in one way or another with the formerly existing families and would form more distinct families, were they so recognized, than, say, the Mellinidæ, Ampulicidæ, Nyssonidæ or Bembicidæ. How these nine supposed families have been disposed of, the following pages will show.

Saussure's recent classification[2] is not satisfactory, inasmuch as it is incomplete, and, moreover, his conclusions, particularly regarding the Pompilidæ, are not well founded. He makes two tribes of this family, the Pompiliens and Pepsiens, separating them on a very trivial character—the position of insertion of the first recurrent nervure in the second submarginal cell, a character which, in my experience, has always proved variable. Under the first mentioned tribe he includes *Ceropales*, which he seems to consider as not worthy of more than generic rank, while he forms a tribe for the reception of *Pepsis*, which should be placed with the Pompiliens, if anywhere. The Mutillidæ and Sapygidæ are considered as subfamilies of the Scoliidæ; these are ranked as families in this paper. The old families Pemphredonidæ and Crabronidæ and *Oxybelus*, he considers as tribes of equal value to the Nyssonidæ, Bembicidæ and Larridæ,

[1] Mr. Cresson states that this was simply compiled from the works of other authors.

[2] Grandidier's Hist. Madagascar, XX.

all of which are ranked as tribes of the Sphegidæ. The two families mentioned and *Oxybelus* are treated as subfamilies in this paper as they are more distinct than are the numerous tribes of the Bembicinæ and Spheginæ.

It is hoped that the paper may at least call forth improvements on the classification suggested.

MUTILLIDÆ.

I regard this as a well-defined family, disagreeing with some authors who place it as a subfamily of the Scoliidæ. The wingless females are, in my opinion, sufficient to separate these insects from the Scoliidæ. In the latter family the intermediate coxæ are widely separated, while in the Mutillidæ they are not separated by a distance equalling their width. In the generic table below, *Photopsis* Blake is considered as synonymous with *Sphærophthalma* Blake, as a comparison of the two genera fails to show *any* differential characters. The family can be separated into two tribes as follows:—

Females (as far as known) without ocelli; marginal cell of (♂) wings more or less short, not reaching by any means the apex of wing; some of the nervures generally obsolete, particularly those forming the third discoidal cell. MUTILLINI.

Females with ocelli; marginal cell of (♂) wings long and pointed, reaching almost the apex of wings; all the nervures distinct, never obsolete MYRMOSINI.

Tribe I.—MUTILLINI.

Contains the genera *Psammotherma*,[3] *Mutilla*, *Sphaerophthalma* (=*Photopsis* in pt.), *Brachycistis* and *Chyphotes*, and is defined as above. The genera may be tabulated as follows:—

1—Antennæ simple in both sexes 2
Antennæ of male flabellate. PSAMMOTHERMA Latr.

2—Eyes ovate, emarginate within the ♂, entire in ♀; thorax of ♀ generally oblong in shape, truncate behind. MUTILLA Linné.
Eyes round, entire; thorax generally ovate, rounded posteriorly 3

3—Intermediate tibiæ with two apical spurs 4
Intermediate tibiæ with but one apical spur; wing stigma very large; body smooth, glabrous; marginal cell usually shorter than stigma; antennæ longer than head and thorax BRACHYCISTIS Fox.

[3] Probably does not occur in America, the species described being very likely erroneously reported from Florida.

4—Abdomen at most subpetiolate; thorax of ♀ divided into more than two parts (body, at least the thorax, coarsely sculptured). 2 SPHÆROPHTHALMA[4] Bl.

Abdomen connected by a long, slender petiole; thorax (♀) divided into two distinct parts only; ♂ unknown. 4. CHYPHOTES Bl.

Tribe II.—MYRMOSINI.

Proposed for the genera *Myrmosa* and *Methoca*, and is characterized chiefly by the females possessing distinct ocelli. But few species have been described from America.

Apex of abdomen (♂), unarmed; wings with three submarginal cells;[5] cubital nervure of hind wings received by the submedian cell at apex; thorax (♀) composed apparently of two parts; body rugose (♀). MYRMOSA Latr.

Apex of abdomen (♂) armed with a curved spine; two submarginal cells; cubital nervure of hind wings received considerably before the apex of submedian cell; thorax (♀) divided into three parts; body smooth, shining and very ant-like. METHOCA Latr.

If the genus *Thynnus* occurs in America as reported by Patton (Ent. News, III, 104) another tribe will have to be added to this family. I doubt, however, the existence of American representatives.

SCOLIIDÆ.

This family is sufficiently characterized by both sexes being winged to separate it from the Mutillidæ. The North American representatives comprise three tribes,[6] as follows:—

Eyes emarginate; spur of fore tibiæ large, strongly curved, dilated, and truncate at end; intermediate tibiæ with one spur; abdomen of ♂ armed with three spines at apex SCOLIINI.

Eyes entire; spur of fore tarsi not much curved or dilated, either pointed or bifurcate at end; intermediate tibiæ with one or two spurs; abdomen of ♂ with but one spine at apex.

Sexes similar in form; marginal cell broadened toward the base (in our genera, the ♀'s have the marginal cell open at apex); antennæ short in both sexes TYPHIINI.

[4] This may ultimately prove but a division or subgenus of *Mutilla*.

[5] There are really four submarginals, as the cubital nervure extends out to the apex of wing.

[6] After Saussure.

Sexes dissimilar in form; ♀ robust, ♂ long and slender; marginal cell (♀) narrowed toward base (in our genera the marginal cell is always closed); antennæ in ♀ short, in ♂ long and slender, as long or longer than head and thorax MYZININI (*Plesiites* Sauss.)

Tribe I.—SCOLIINI.

Two genera occur in our fauna, as follows:—

Anterior wings with only one recurrent nervure SCOLIA Fabr.
Anterior wings with two recurrent nervures ELIS Fabr.

Each of these genera may be divided into subgenera by the number of submarginal cells. In the subgenus *Triscolia* there are three cells, while in *Discolia* there are two. In *Trielis* three, in *Dielis* two.

Tribe II.—TIPHIINI.

The first and second submarginal cells merged into one through the disappearance of the first transverso-cubital nervure; base of first abdominal segment produced angularly or dentate on each side; intermediate tibiæ with one spur TIPHIA Fabr.
Three submarginal cells, the first transverso-cubital nervure present, but abbreviated, not reaching the cubital nervure; base of first abdominal segment not produced or dentate at base; intermediate tibiæ with two spurs EPOMIDIOPTERON Sichel (= *Paratiphia*).

Tribe III.—MYZININI.

This tribe is identical with Saussure's "Section des Plesiites." *Plesia* seems to be synonymous with *Myzine* Latr. The latter has priority, being described two years in advance of *Plesia*. But one genus, *Myzine*, is found in America, which may be distinguished by the tribal characters given above.

SAPYGIDÆ.

Intermediate coxæ contiguous; legs, except tibial spurs, unarmed; no pygidial area; apex of (♂) abdomen without spines. These characters seem sufficient to keep these insects distinct from the preceding family, to which they have been assigned by some authors, and, moreover, the first and second ventral segments are contiguous, while in the Scoliidæ they are widely separated. *Sapyga*, our only genus, has the eyes emarginate within, the intermediate tibiæ with two spurs. For several species having the vertex tuberculate, the

name *Eusapyga* has been proposed by Cresson, but these form only a subgenus at the most.

POMPILIDÆ.

This is a distinct family characterized by the very long posterior legs, long antennæ, and by the first and second ventral segments being not widely separated. The species possess no pygidium. I would separate the family into three tribes, placing the Ceropalini first, as I consider the genus *Ceropales* as being closest to the Sapygidæ.

Sting sheath of ♀ projecting, prominent; eyes slightly emarginate within, near the top; labrum large, projecting; antennæ never curled after death, situated well above the clypeus CEROPALINI.

Sting sheath of ♀ not projecting; eyes entire.

First discoidal cell not longer than first submarginal; submedian cell of anterior wings longer than the median on the externo-median nervure; second discoidal cell not half the size of the third; labrum exserted, longer than the clypeus; abdomen compressed apically NOTOCYPHINI.

First discoidal cell longer than first submarginal; labrum not exserted; length of median cell of anterior wings variable; second discoidal cell at least half the size of the third; abdomen rarely compressed. POMPILINI.

Tribe I.—CEROPALINI.

This tribe contains but a single genus, *Ceropales*, having the characters given above. The species are always more or less ornamented with yellow, some being extremely handsome.

Tribe II.—NOTOCYPHINI.

The genus *Notocyphus* constitutes this tribe, which differs chiefly from the Ceropalini by the non-exserted sting sheath.

Tribe III.—POMPILINI.

The Pompilini contains the typical forms of the family and is, by far, the largest tribe. *Pepsis*, which Saussure considers as a tribe, should, in my opinion, be placed in the tribe Pompilini, as its characters will not warrant a tribal distinction. *Parapompilus* Cress. (non Sm.), *Planiceps* Latr., and *Aporus* Spin., seem to be merely groups of the genus *Pompilus*, as has been pointed out by Kohl.[1] *Epipom-*

[1] Verh. zool.-bot. Gesell., Wien, XXXIV, pp. 33–58.

pilus Kohl is scarcely worthy of generic distinction, and should be treated as of equal value as *Parapompilus* Cress.

1—Anterior wings with three submarginal cells 2
Anterior wings with two submarginal cells 9
2—Third[8] ventral segment with a transverse furrow (indistinct in the ♂ of some species) 3
Third ventral segment without a transverse furrow 6
3—First recurrent nervure received by the second submarginal cell in or about the middle. Hind tarsi (♂) not flattened 4
First recurrent nervure received by the second submarginal cell not far from its base, and considerably before its middle. Hind tarsi (♂) flattened. Fifth, or fifth and sixth ventral segments (♂) nearly always with long, stiff hair, often forming two tufts. Metathorax with a more or less developed tubercle before each stigma. PEPSIS Fabr.
4—Hind tibiæ not spinose, or scarcely so; submedian cell of fore wings generally but slightly longer than the median on the externo-medial nervure. 6
Hind tibiæ more or less spinose, generally serrato spinose, most strongly so in the ♀ 5
5—Submedian cell of fore wings longer than the median on the externo-medial nervure. . . . SALIUS Fabr. (= *Priocnemis* Sch.).
Submedian cell of fore wings of the same length as the median on the externo-medial nervure (eyes converging somewhat towards the vertex) CALICURGUS Lep.[9]
6—Maxillæ of ♀ with a bunch of long hair at the base. AGENIA[10] Schiodte
Maxillæ of ♀ naked. PSEUDAGENIA[10] Kohl.
7—Prothorax shorter than the metathorax. 8
Prothorax longer than the metathorax; head very flat and transverse, the clypeus planate . PARAPOMPILUS Cress. (non Smith).
8—Legs strongly spinose; prothorax on the sides not strongly depressed; fore femora not swollen POMPILUS Fabr.
Legs, except tibial spurs, not spinose; prothorax strongly depressed on the sides; fore femora somewhat swollen EPIPOMPILUS Kohl.

[8] Second ventral of some authors.

[9] I have not seen this genus.

[10] I can find no characters to separate the ♂'s of *Agenia* and *Pseudagenia*, as the characters given by Kohl are not constant. The size of the second and third submarginal cells varies, and while some species of *Agenia* have the wings banded, in others they are clear. Of our species of *Agenia* Cress., *cupidus*, *congruus*, and *acceptus* are *Pseudagenia*. A new genus may have to be erected for *A. Belfragei* Cress. Cameron is mistaken in referring *A. nubifer*, *mexicanus*, *chloris*, *floridus*, *auripilis*, and *subvirescens* to *Pseudagenia*, as they all have the bunch of hair at base of maxillæ.

9—Metathorax posteriorly not emarginate, not produced; anterior femora swollen, their tarsi also rather thick; abdomen subcompressed. PLANICEPS Latr.

Metathorax posteriorly strongly emarginate, produced on each side into a strong tooth; fore femora and tarsi not thickened; abdomen not at all compressed APORUS Spin.

SPHEGIDÆ.

I would divide this vast family into five subfamilies as follows: Spheginæ, Pemphredoninæ, Bembicinæ, Oxybelinæ, and Crabroninæ. I have thought it best to unite under one head the Larridæ, Bembicidæ, Nysonidæ, Mellinidæ, and Philanthidæ, as it is impossible to find characters by which these families (so-called) can be limited, even as subfamilies. The reader is referred to Handlirsch's paper on *Nysson* and *Bembex*.[11] It may seem out of place to put the Pemphredoninæ close to the Spheginæ; yet I feel justified in doing so on account of the abdominal petiole which is peculiar to both subfamilies.

Abdomen connected with the thorax by a slender pedicel of variable length, and never sessile with the following segment.

Intermediate tibiæ with two apical spurs; claws nearly always more or less dentate within SPHEGINÆ.

Intermediate tibiæ with but one apical spur; claws never dentate within PEMPHREDONINÆ.

Abdomen never connected with the thorax by a slender pedicel, at the most subpetiolate as in *Mellinus*.

More than one submarginal cell, if not, then the eyes are emarginate within; neuration of posterior wings complete. BEMBICINÆ.

Only one submarginal and two discoidal cells (eyes entire).

Metathorax with a long projection[12] at base; postscutellum with a squama on each side; submarginal cell confluent with first discoidal cell; eyes elongate-ovate, fully three times longer than they are broad medially and converging towards the vertex OXYBELINÆ.

Metathorax and postscutellum without spines or squamæ; submarginal cell not confluent with the first discoidal cell; eyes very broad, not more than twice as long as the width of their broadest part and strongly diverging towards the vertex. CRABRONINÆ.

[11] Sitzungsb. K. K. Akad. der Wissen., Wien, XCV, Abth. 1.

[12] This is variously shaped, being sometimes bifurcate and again spinose.

Subfamily SPHEGINÆ.

Represented by two tribes as follows:—

Metathorax unarmed, never dentate SPHEGINI.
Metathorax armed with two strong teeth AMPULICINI.

Tribe I.—SPHEGINI.

Three genera belong to this tribe. They have numerous subgenera or groups of species which at one time were regarded as genera. Kohl's admirable paper, Die Hymenopterengruppe der Spheciden,[13] will be of much value to the student of this group.

Our genera may be separated in the following manner:—

Second submarginal cell receiving but one recurrent nervure; ♀ with or without tarsal comb SPHEX Linné.
Second submarginal cell receiving both nervures.
♀ without tarsal comb SCELIPHRON Klug.
♀ with tarsal comb AMMOPHILA Klug.

As Kohl's work is probably inaccessible to most workers, I give here a table of groups of the three genera:—

Genus SPHEX Linné.

Second submarginal cell small, much higher than broad.
Claws with a single tooth in middle of inner margin; species more or less metallic Gr. CHLORION.
Claws with 2–5 teeth on inner margin; species not metallic.
Last ventral plate (♀) compressed, almost keeled medially; claws bidentate; clypeus produced medially, with a deep sinus on each side Gr. PALMODES.
Last ventral plate (♀) convex, not compressed; claws 2–5 dentate; clypeus entire or emarginate medially . . . Gr. HARPACTOPUS.
Second submarginal cell as broad as high, rhomboidal, or rectangular.
Metathorax without stigmal furrow; tarsal comb (♀) wanting; petiole long and generally bowed Gr. ISODONTIA.
Metathorax, with exception of *S. Lucæ*, with a stigmal furrow; tarsal comb (♀) present, petiole straight Gr. SPHEX.

Genus SCELIPHRON Klug.

Prothorax longer than the dorsulum.
Head from above not triangular, not much produced behind the eyes (the prothorax is but little longer than the dorsulum).
. Gr. PODIUM.

[13] Annalen d. K. K. Naturhistor. Hofmuseum, Wien, V, No. 2, 3.

Head from above triangular, greatly produced behind the eyes (the prothorax is longer than the dorsulum, scutellum and postscutellum combined) Gr. TRIGONOPSIS.
Prothorax not as long, at any rate not longer than the dorsulum. Gr. SCELIPHRON (=*Pelopoeus*).

Genus AMMOPHILA Kirby.

Wings with two submarginal cells Gr. COLOPTERA.
Wings with three submarginal cells.
Second abdominal segment elongate, forming with the first segment a long petiole Gr. AMMOPHILA.
Second abdominal segment more or less campanulate, the petiole composed of but one joint Gr. PSAMMOPHILA.

Tribe II.—AMPULICINI.

The genus *Ampulex* is represented in North America by the subgenus *Rhinopsis* Westw. It is distinguished by the rostrate clypeus and by having two submarginal cells. The prothorax is long as in *Trigonopsis;* the metathorax is many ridged and has very strong transverse striæ above and possesses two strong teeth. The first submarginal cell is twice the length of the second. Marginal cell with an appendiculation at apex.

Subfamily PEMPHREDONINÆ.

The Mimesidæ are here considered as representing a tribe of this subfamily, and *Mimesa* Shuck. as a synonym of *Psen* Latr. It is impossible to separate these two genera as their characters vary, particularly the neuration. It is true that the inner spur of hind tibiæ of *Mimesa* is peculiarly shaped, but this development will be found in *Psen*, although in a lesser degree.

Anterior wings with three submarginal cells; antennæ situated far above the clypeus PSENINI.
Anterior wings with two submarginal cells; antennæ close to base of clypeus PEMPHREDONINI.

Tribe I.—PSENINI.

Psen (= *Mimesa*), the only genus of this tribe, is easily distinguished by the characters given in the above table. The Psenini further differ from the Pemphredonini by the peculiar inner spur of hind tibiæ.

Tribe II.—PEMPHREDONINI.

The tribe Pemphredonini comprises the greater number of the

genera of this subfamily. The following table is based chiefly on that in Cresson's "Synopsis":—

Anterior wings with three discoidal cells, therefore with two recurrent nervures.

Abdomen with a tolerably long petiole . . . PEMPHREDON Latr.

Abdomen with the petiole not longer than the hind coxæ.

Posterior tibiæ spinose or subserrate; labrum emarginate at tip.[14] DIODONTUS Curt.

Posterior tibiæ (excepting the calcaria) unarmed; labrum pointed at tip. PASSALŒCUS Shuck.

Anterior wings with two discoidal cells, therefore only one recurrent nervure

Anterior wings with one submarginal cell . AMMOPLANUS Giraud.

Anterior wings with two submarginal cells.

Petiole short; recurrent nervure joining the first transverso-cubital nervure SPILOMENA Shuck.

Petiole long; recurrent nervure received in the middle of the first submarginal cell STIGMUS Jur.

Subfamily BEMBICINÆ.

Under this head I unite the Larridæ, Bembicidæ, Nyssonidæ, Philanthidæ, and Mellinidæ. The characters of these supposed families are not sufficient or constant enough to sustain them in such a rank, and are valueless in some cases, even as characters of minor importance. As in the case of the Bembicidæ, it is easy to take such types as *Bembex*, *Monedula*, forms with rostrate clypeus, and separate them into a family, apparently distinct from the Nyssonidæ and Larridæ, if these genera are compared, say, with *Larra* and *Nysson*; but certain genera will be encountered, *Neolarra* and *Bothynostethus* for instance, whose proper position will remain undetermined. *Neolarra* combines both Larrid, Bembicid and Nyssonid characters, yet it will fit in neither of the families defined. *Bothynostethus* inclines to both the Larridæ and Nyssonidæ, and seems to be a connecting link between them. *Stizus* and *Sphecius*, although placed in the Bembicidæ, possesses the neuration and non-rostrate labrum, characters which bind them to the Nyssonidæ. It must not be forgotten that the labrum of the Nyssonidæ is prominent, indeed in *Gorytes* very prominent. Thirteen tribes of this subfamily seem to be indictated, which number will undoubtedly have to be reduced in the future.

[14] I have not seen *Polemistus* Sauss., described as occurring in Madagascar and Mexico. It is related to *Passalœcus* and *Diodontus*.

1—Labrum projecting in such a manner as to cover the mandibles when closed, sometimes rostriform 4
Labrum projecting more or less,[15] but not covering the mandibles, never rostriform; antennæ situated close to or not far from base of clypeus; if the latter is divided into three lobes the middle lobe is not greatly enlarged 2
Labrum not at all projecting, hidden from view by mandibles; antennæ situated far above the clypeus; middle lobe of latter greatly enlarged. PHILANTHINI.
2—Mandibles emarginate on outer margin (except in *Trypoxylon*) . 5
Mandibles not emarginate 3
3—Three submarginal cells; intermediate tibiæ with two spurs.
Second submarginal cell not petiolate; apical joint of antennæ (♂) normal. MELLININI.
Second submarginal cell petiolate; apical joint of antennæ (♂) peculiarly shaped. NYSSONINI.
Two submarginal cells; intermediate tibiæ with one spur.
. NEOLARRINI.
4—Intermediate tibiæ armed with two spurs at apex; submedian cell of posterior wings extending far beyond the median on the externo-medial nervure; labrum shorter than the clypeus, generally rounded anteriorly; ocelli distinct STIZINI.
Intermediate tibiæ with but one spur at apex; submedian cell of posterior wings not extending beyond the median on the externo-medial nervure; labrum longer than the clypeus, rostriform; ocelli more or less imperfect BEMBICINI.
5—Hind ocelli normal. 6
Hind ocelli more or less distorted LARRINI.
6—Eyes entire. 7
Eyes emarginate within. TRYPOXYLONINI.
7—Second submarginal cell not petiolate. 8
Second submarginal cell petiolate. 10
8—Middle tibiæ armed with two spurs at apex. 9
Middle tibiæ with one spur at apex LYRODINI.
9—Eyes (♂) touching above; second submarginal cell receiving both recurrent nervures ASTATINI.
Eyes (♂) not touching on the vertex, widely separated; first and second submarginal cells each receiving a recurrent nervure . .
. DIPLOPLECTRINI.
10—No pygidial area (two submarginal cells) MISCOPHINI.
A pygidial area (three submarginal cells)
. BOTHYNOSTETHINI.

Tribe I.—PHILANTHINI.

Hind femora more or less thickened at apex, truncate, and produced beneath CERCERIS Latr. (=*Eucerceris* Cr.).

[15] Astatini and Dioploplectrini seem to be exceptions to this definition, or else the labrum projects so little as to be indiscernible.

Hind femora more or less narrowed at apex, not truncate, and not produced beneath.

Abdomen with first segment not at all petiolate.

Eyes entire within; submedian cell of posterior wings much shorter than the median on the externo-medial nervure; ♀ with a distinct pygidial area APHILANTHOPS Patt.

Eyes more or less emarginate within; submedian cell of posterior wings as long or slightly longer than the median on the externo-medial nervure; ♀ without a pygidial area. PHILANTHUS Fabr.

Abdomen with first segment subpetiolate, as in *Mellinus*. TRACHYPUS Kl.

Tribe II.—MELLININI.

In this tribe I include *Mellinus* and *Gorytes*, separating them from the Nyssonini chiefly because the apical joint of the ♂ antennæ is normal and is not crescent or otherwise shaped as in the Nyssonini; also because the second submarginal cell is not petiolate as in that tribe.

Antennæ well separated, situated close to base of clypeus, anterior margin of clypeus denticulate; a recurrent nervure received by the third submarginal cell; abdomen always with first segment always petioliform MELLINUS Fabr.

Antennæ approximate, generally well separated from base of clypeus; anterior margin of clypeus rarely or never dentate; third submarginal cell never receiving a recurrent nervure, abdomen rarely with the first segment petioliform . . . GORYTES Latr.

The genera *Hoplisus*, *Dienoplus* and *Euspongus* are identical with *Gorytes*

Tribe III.—NYSSONINI.

Prothorax above subquadrate, longer than dorsulum; metathorax not strongly spinose; (posterior femora beneath at apex, produced into a stout tooth), form slender.

Submedian cell of anterior wings much longer than the median on the externo-medial nervure; abdomen without a pale spot on each side of the second dorsal segment . . . DIDINEIS Wesm.

Submedian cell of anterior wings a little shorter than the median on the externo-medial nervure; abdomen with a pale spot on each side of second dorsal segment ALYSON Jur.

Prothorax above very narrowly transverse; metathorax with two long spines (tooth of posterior femora not so strong as in the preceding two genera); form robust NYSSON Latr.

In the foregoing table *Paranysson* and *Hyponysson* are considered synonymous with *Nysson*. The lack of the third submarginal cell in *N.* (*Hyponysson*) *bicolor* is simply an anomaly.[16] I have recently received another anomalous species (which is new) from New Mexico, which lacks the second (petiolated) submarginal cell.

Tribe IV.—STIZINI.

Marginal cell about twice as long as the first submarginal; spurs of hind tibiæ enlarged in the ♀, and the pygidium well developed; abdomen (♂) with a single spine at apex . . . SPHECIUS Dhlb.

Marginal cell much shorter than the first submarginal; spurs of hind tibiæ short in both sexes, not enlarged; no pygidium, at the most with two short ridges on each side of apical portion of last dorsal abdominal segment; abdomen (♂) with three spines at apex STIZUS Latr.

Bembecinus and *Megastizus* are considered synonymous with *Stizus* in the foregoing table.[17]

Tribe V.—BEMBICINI.

Anterior ocellus linear, transversely arcuate.

Maxillary palpi six-jointed, labial palpi four-jointed. Metathorax excavated posteriorly, compressed laterally; last ventral segment (♂) with three spines. BEMBIDULA Burm.

Maxillary palpi four-jointed, labial palpi two-jointed; metathorax flat or convex behind, not compressed laterally; last ventral segment (♂) with a single spine. BEMBEX Fabr. (=*Microbembex* Patt.).

Anterior ocellus elliptic, round or reniform.

Maxillary palpi three-jointed, labial palpi one-jointed; anterior ocellus longitudinally elliptic; maxillæ very long, reaching the hind coxæ STENIOLIA Say.

Maxillary palpi six-jointed, labial palpi four-jointed; anterior ocellus round or reniform; maxillæ short . . MONEDULA Latr.

Tribe VI.—NEOLARRINI.

This tribe is based on a single genus *Neolarra* Ashm. which may be distinguished by its tribal characters. I have not examined this genus during the preparation of this classification, but if my memory serves me right it should be placed here, between the *Bembicini* and *Bothnostethini*.

[16] See Handlirsch, Sitzb. K. Akad. Wissensch., Wien. Math.-naturw. Classe, XCV, Abth. 1, p. 293.

[17] See Handlirsch, l. c. CI, p. 26–34.

Tribe VII.—BOTHYNOSTETHINI.

Marginal cell truncate, with an appendiculation; eyes converging towards vertex; hind femora not thickened at apex PLENOCULUS Fox.

Marginal cell pointed at tip, without appendiculation; eyes diverging towards vertex; hind femora, especially in ♀, thickened at apex. BOTHYNOSTETHUS Kohl.

Tribe VIII.—ASTATINI.

This tribe is formed of the genus *Astatus*, and is based chiefly on the strange disposition of the eyes of the male sex; they meet on the vertex, a characteristic not found in any other genus of the fossorial Hymenoptera, and not, as far as I know, in any genus of the Order.

Tribe IX.—DIPLOPLECTRINI.

The genus *Diploplectron* forms this tribe. The chief characters are that both sexes have the middle tibiæ two spurred, the very short submarginal cell and the prominent and very long prothorax. It is evidently allied to the European genus *Dinetus*, which probably belongs to this tribe. As the latter is the older genus, the name proposed for this tribe will have to give way to *Dinetini*, but as *Dinetus* does not occur in North America, and as this is simply a classification of the forms inhabiting that region, I prefer to use the name proposed above.

Tribe X.—MISCOPHINI.

Wings with two submarginal cells, the first receiving a recurrent nervure; marginal cell acuminate, not appendiculate; eyes converging but little or not at all towards vertex . . . MISCOPHUS Jur.

Wings with three submarginal cells, both recurrent nervures being received by the second submarginal cell; marginal cell elongate, truncate at apex and appendiculate; eyes strongly converging towards vertex NITELIOPSIS Saund.

Tribe XI.—LYRODINI.

Lyroda, upon which this tribe is based, might be placed in the Larrini, were it not for the regularly formed and distinct ocelli. The only other character worth mentioning in which it differs from the following tribe, is the peculiar shape of the prothorax above, which is being apparently twice emarginate, with the intervening space strongly developed.

Tribe XII.—LARRINI.

Under this head are placed all those genera of the old family Larridæ, which have the hind ocelli distorted and more or less obsolete.

Just within the inner eye margins there is a more or less developed longitudinal fold or swelling.

Mandibles not dentate within; outer side of anterior tibiæ armed with strong spines; pygidium (♀) not pubescent . . . LARRA Fabr.

Mandibles armed with one or two teeth within.

Pronotum drawn under the dorsulum, especially at the sides; metanotum longer than the dorsulum; anterior femora (♂) not emarginate near the base; pygidial area covered with a hoar-frost-like pile NOTOGONIA Costa.

Pronotum not drawn under the dorsulum; metanotum shorter than the dorsulum; anterior femora (♂) emarginate near the base as in *Tachysphex* and some species of *Tachytes;* pygidial area on apical portion with short, stiff hairs. ANCISTROMMA Fox.

Within the inner eye margins there are no signs of a swelling or fold.

Comb on anterior tarsi (♀) composed of stiff, tolerably short thorns; pygidial area entirely covered with pubescence; hind ocelli linear, hooked at upper end; fore femora of ♂ either emarginate or not emarginate near the base beneath . TACHYTES Pz.

Comb on anterior tarsi (♀) composed of very long flexible spines or bristles; pygidial area naked; hind ocelli oval; fore femora (♂) always emarginate near the base beneath . TACHYSPHEX Kohl.

Tribe XIII.—TRYPOXYLONINI.

Anterior wings with three submarginal cells; abdomen short, sessile.

Female with a well-developed pygidium; marginal cell shorter than the first submarginal; antennæ of ♂ more or less dentate PISONOPSIS Fox.

Female without a pygidium; marginal cell nearly as long as the three submarginal cells united; antennæ of ♂ not dentate. PISON Spin.

Anterior wings with two submarginal cells; abdomen long, clavate TRYPOXYLON Latr.

Subfamily OXYBELINÆ.

In my opinion the peculiar armature of the metathorax and postscutellum, together with the form of the eyes and neuration, justifies the retention of the genus *Oxybelus* in a subfamily. Saussure forms a tribe of it.

Subfamily CRABRONINÆ.

Eyes hairy; mandibles emarginate exteriorly.

. ENTOMOGNATHUS Dhlb.

Eyes not hairy; mandible not emarginate externally.

Second discoidal cell long, narrow, obtusely pointed at apex, longer than the first discoidal cell; form short, robust; abdomen beneath flat, or subconcave ANACRABRO Pack.

Second discoidal cell broadest at apex, shorter than the first discoidal; form elongate; abdomen convex beneath.

. CRABRO Fabr. (= *Rhopalum*).

RECENT MOUND EXPLORATION IN OHIO.

BY GERARD FOWKE AND W. K. MOOREHEAD.

During the past summer (1894) a number of mounds have been explored in Ohio in behalf of the Academy of Natural Sciences of Philadelphia. The reports of Mr. Gerard Fowke relating to the Van Meter mound and of Mr. Warren K. Moorehead as to the Metzger mound are appended. CLARENCE B. MOORE.

"MOUNDS IN PIKE COUNTY, OHIO.—Three miles south of Piketon, half a mile from the point where Beaver Creek discharges into the Scioto river, on the farm of J. M. Van Meter,[1] is a 'double mound' on the highest terrace. The larger part, measuring, after being plowed over for a number of years, 75 feet in diameter and 10 feet high, has its west base just at the brink of the terrace at a point where the bluff is 50 feet high, quite steep, with the creek at its foot. The smaller, south of east from the first, is six and one-half feet above the surrounding level and 56 feet in diameter. At the junction of the two, the top is three and one-half feet above the general level.

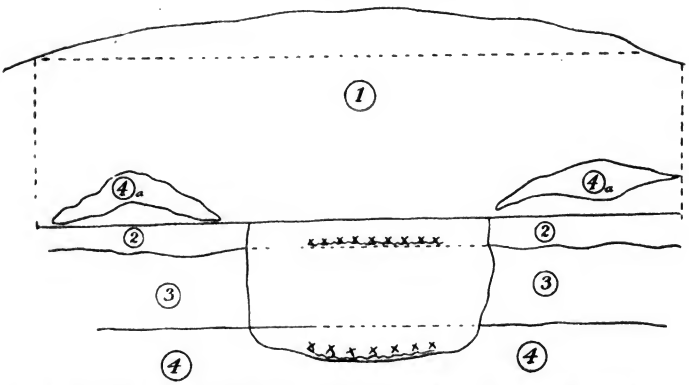
"A trench 10 feet wide was started in the east side of the smaller mound, gradually widening until it was 25 feet at the center, and then drawing in until it was 20 feet wide at 15 feet west of the center. Beneath the middle part was a core 20 feet across and 3 feet high of soil placed and packed, or much tramped, while wet; it was somewhat darker than the loam composing the remainder of the mound, quite hard, and broke off in clods.

"On the original surface of the ground, beginning about five feet east of the center, was a burned place a little over 20 feet across at the widest part, and reaching 20 feet west of the center, or nearly to the lowest point between the mounds. A fire had been burned over this area for a short time only and with a small amount of wood, as the burned earth was nowhere more than an inch thick, most of it much less, while the charcoal and ashes varied from a mere streak

[1] See Catalogue of Prehistoric Works East of the Rocky Mountains, by Cyrus Thomas, page 182. C. B. M.

to a little more than an inch except in one place where a short log six inches in diameter was converted into charcoal.

"Except an arrow and a spear, found loose in the dirt, there was not a relic of any description, nor the smallest fragment of a human bone. A few pieces of much burned bones of small animals or large birds were in the charcoal at the center, and many small pieces of burned stone were scattered all through the mound. The eastern



Section of deep grave, 20 feet south from center of larger mound on Van Meter farm.
1. Body of mound, 6 feet.
2. Soil, 1 foot.
3. Subsoil, 3 feet.
4. Gravel, (to bed of river).
4*a*. Gravel thrown from excavation.
XXXXX. Position of human bones.
Scale. .18 of an inch equals 1 foot.

half contained a large amount of ashes and much charcoal, thrown in with the dirt to help fill up.

"In the larger mound a circle forty feet in diameter was laid off with the apex as the center. This brought the circumference about four feet below the top.

"In the cap, 12 feet east of center were decayed human bones with a few rough beads and fragments of pottery; at the same distance southwest of center were others with a spear or knife by one femur and a flint chisel, polished at the sharp end, near the skull. None of the bones were entire, and being so close to the surface were

as soft as ashes. Six feet southeast of center a flint knife lay near fragments of a skull; and at the place where the chest bones would have been were fragments of a pot that seemed to have been entire when deposited. Less than a foot from the apex were fragmentary human bones.

"A knife and a boat-shaped slate ornament with a crease around the middle were loose in the dirt. Nothing further was found in the upper portion. A well wrought flint spear, 8½ inches long, and a hematite hemisphere were found on the top of this mound some years ago—perhaps plowed out. All the loose earth was now scraped away and concentric circles, five feet apart, laid off on the level surface of the top. In the outer ring, on the northern and western sides, within a foot or less of the top were traces of six skeletons, intrusive burials; nothing was found with any of them.

"A little west of south from center, with its inner margin 17 feet from that point, was an elliptical grave, dug before the mound was begun. It measured a little more than nine feet long and a little more than five feet wide, with the longer axis very nearly east and west. At about 18 inches below the original surface, along the center line of the grave, a body had been placed. Only fragments of the teeth and skull remained, except that a few small pieces of the pelvis and finger bones were preserved by the action of five small rectangular copper plates[2] that had evidently been fastened around the wrist. These plates were in a little mass of very loose, dark earth, probably remains of some sort of fur or fabric, stained in a few places with red ochre. Nothing else was found in the grave until at the bottom, more than a foot below the upper level of the gray sand, which here lies four feet under the proper surface. At this level lay a few decayed pieces of bones of a medium sized person extended on the back, head east, exactly under the upper skeleton. The body had been covered with bark or wood which extended to the margin of the grave on every side and gave a reddish-brown tinge to the lower two inches of filled-in earth. This earth was from a swamp or low bottom, being black and sticky and evidently packed in wet, causing the entire decay of the skeleton which would otherwise have been well preserved by the dry sand in which it lay. The grave wall was cut down straight for

[2] See note. C. B. M.

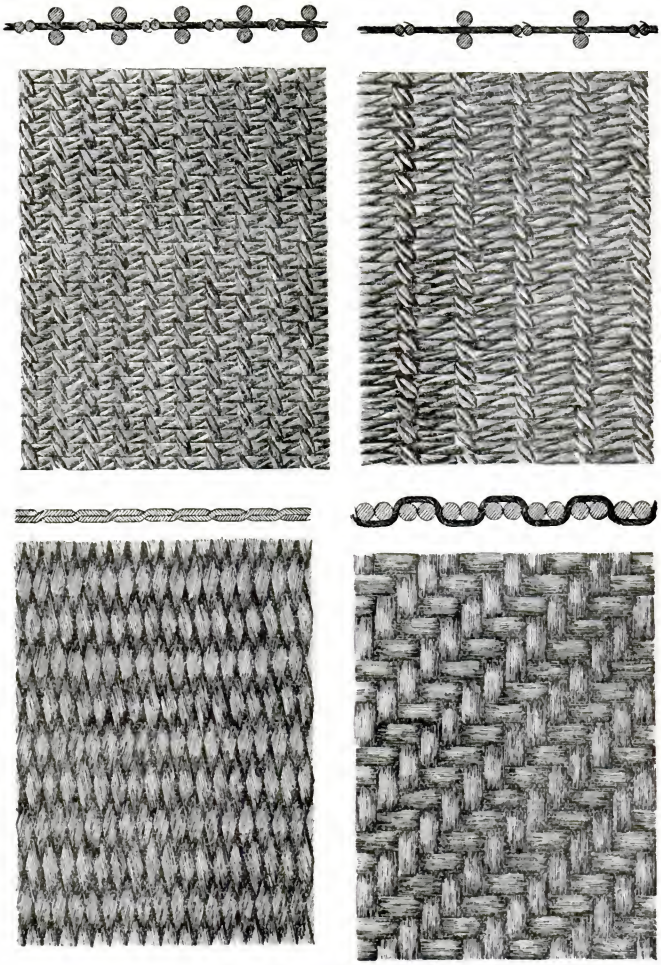
two feet; below this the ends drew in somewhat, while the sides were slightly overhanging, probably from caving in of the gravel while it was being dug. The work was done from the south side, as most of the earth was thrown to that side, the remainder being piled at the two ends.

"At 15 feet north of the center began a streak of burned earth, charcoal, and ashes, which gradually thickened toward the center. It proved to be nearly circular in outline and 20 feet across. For three or four feet around the margin the ashes seem to have been swept toward the center, as the natural earth of the mound had been deposited directly on that burned, without any ashes or charcoal intervening. At eight feet north of center the mass thickened to a foot and held this thickness for six feet farther, and for nearly eight feet east and west. The material forming the charcoal varied from sedge grass to small trees, the largest piece being a pine log a foot in diameter and six feet long. The inner portion of this was in its natural condition, the charred outside having preserved the part to which the fire had not reached. Much of the charcoal was from wood burned while green and was bright as polished metal where it had been kept tolerably dry. There were a few fragments of animal bone here and there, and enough small pieces of human bone to show that a body or skeleton had been cremated, some of them being like cinder, others scarcely charred. The thinness of the ashes and the amount of the charcoal showed that the fire had been smothered while much of the fuel remained on it. Lying on the top of the charcoal where it was thickest was a considerable quantity of charred cloth, showing at least four distinct methods of weaving; there was also much of what seemed to be fur or some such material; the latter was soft as soot, while some of the cloth was fairly well preserved, a very little of it showing scarcely any mark of burning.

"Except as noted above, no relics of any description were found anywhere in the lower part of the mound.

GERARD FOWKE."

The five rectangular sheets of copper found with human remains by Mr. Gerard Fowke, beneath the base of the larger Van Meter mound, near Piketon, Pike Co., Ohio, consisted of sheet copper oxidized and carbonated to a certain extent, though a large percentage of metal was unaffected. These sheets, though not exactly similar as to



Vegetable fabric, with sections. Larger Van Meter Mound. (Double size.)

length and breadth, do not vary materially, so that the measurement of one, namely 2·5 inches by 3·2 inches, may be considered to apply approximately to all. That they had been portions of a sheet or sheets of larger size was evidenced by at least one closely ground edge on each specimen, contrasting markedly with the rough line of separation of the other margins. No ornamentation like the beaded margin and the *repoussé* work of Florida and Tennessee was apparent, though the marks of numerous blows from a convex blunt cutting-edge were visible on all the specimens. Exfoliation was noticeable near the edges. The sheets were of irregular thickness averaging about 1 mm.

Notwithstanding these indices of aboriginal origin, so solid was the appearance of the copper that, though no believer in a post-Columbian origin for mounds as a rule, I admit having experienced a feeling of doubt as to the origin of this copper, a doubt which a thorough and careful analysis, made by Ledoux and Company, of New York, speedily dispelled. The result is given in detail:—

"Copper	99·9130
Silver	0·0198
Arsenic	0·0026
Antimony	Trace
Iron	0·0233
Nickel and cobalt	0·0080

"NOTE:—The above analysis was made after removing the superimposed film of oxides and carbonate from the sample. Special examination for lead, bismuth, and zinc shows that none of these is present."

It is quite evident that here we have to do with native copper of a purity greater than is ordinarily produced at the present time by any smelting process[3] and consequently of a still higher degree of purity than would be the product of early processes of smelting the arsenical sulphide ores of Europe[4]. Moreover, the introduction of lead in refining, though not an invariable custom, was extensively practised in Europe, especially in copper intended for sheet or wire, and its

[3] All smelted copper contains from three to ten hundredths of one per cent. of combined oxygen.

[4] For full details as to aboriginal copper the reader is referred to "Certain Sand Mounds of the St. John's River, Florida, Part II," Journ. Acad. Nat. Sci., Vol. X.

absence, in connection with freedom from considerable quantities of arsenic, or antimony, or both, may always be regarded as good evidence against an early European origin.

CLARENCE B. MOORE.

"THE METZGER MOUND.—This structure, the property of Mr. Charles Metzger, is located on Deer Creek, about two miles from Yellow Bud (southwest). Situated upon a hill one hundred and fifty or one hundred and sixty feet in altitude, the mound commands a fine view of the surrounding country. The plains stretch away towards the Scioto three miles distant and continue two miles east of the river, where they terminate in high hills. The mound is very nearly round, and is thirty-four feet in height by two hundred feet in diameter at the base. Alongside of it is a horse-shoe or crescent-shaped embankment and two small mounds.

"On August 20, 1894, work was begun upon the structure. The mound had been originally opened by some farmers. When they began work the structure stood forty feet in height. They sank a circular shaft eight feet in diameter from the apex downwards.

"Our men first reduced the height of the mound about ten feet. This gave a platform fifty feet in diameter and twenty-four feet above the surrounding surface. The ground in the center of the structure (where the previous excavation had been sunk), we found to be very damp and heavy, and as we proceeded downward, we became convinced that the log pen found by the original excavators in the center of the structure would be in a bad condition, and that we must depend on other pens were we to take out any logs entire.

"The structure was composed of ordinary hill clay. At the top it was not stratified, and as it varied but slightly in color, it was extremely difficult to distinguish any of the 'dumps.'[5] On August 22nd a very fragmentary skeleton was found about twelve feet below the top and four feet southwest of the central excavation. The body had been originally buried in bark which percolation of water from above had utterly decomposed. With the bones was a spool-shaped button of copper, about an inch in diameter, heavily coated with copper oxide.

"The 25th two teams were put upon the mound, and they, together with the shovels, reduced it rapidly. When within four feet of the

[5] A "dump" represents the load deposited by one man.—C. B. M.

top of the log pens we dispensed with the teams and used the shovellers for the remainder of the work. One or two arrow-heads were found during the course of the excavations.

"At eighteen feet from the top and eight feet north of the center was a fairly well preserved skeleton surrounded by pieces of saplings and logs, two to four feet in length. These were originally laid, one above the other, to the height of about a foot. These logs, being of small size, when decayed, had broken beneath the weight of earth. The bones of the skeleton were unusually yellow. No relics were found with the remains. We saved some samples of the wood, which experienced timber men pronounced oak and walnut.

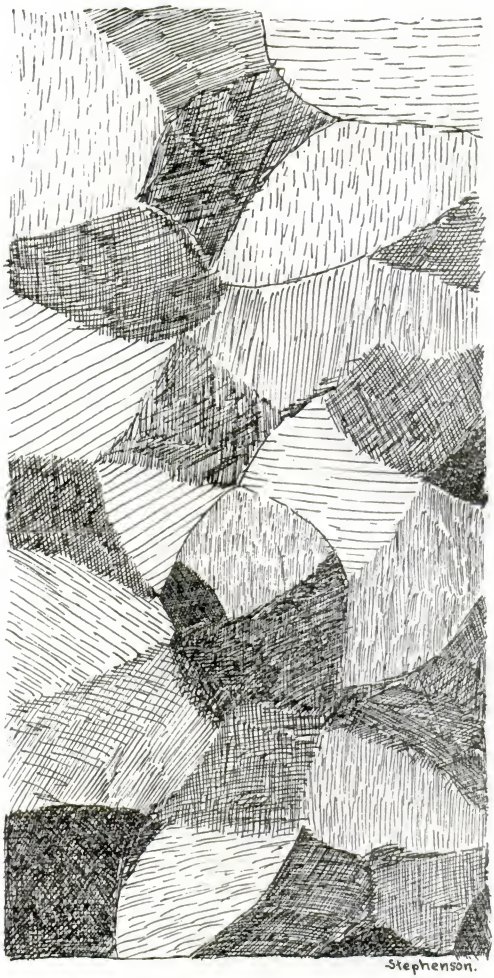
"On the 27th and 28th numerous bunches of fine roots and underground moss were encountered. Samples of the moss were preserved. There were also several deposits of boulders, made without apparent reason. The mound, at this point (twenty-three feet from the top, nine feet from the bottom), appeared to be stratified, and the earth was very soft in places.

"The log pen in the center of the mound, and the one northwest of it, remained for many years before they caved in. That is, the



Metzger Mound, diagram showing banded structure of portion of east wall of trench when partially excavated.

wood did not decay for a long period of time. In the case of the first or largest pen (central one) the earth was kept out of a space 12 x 15 x 4 feet. The second pen occupied a space about 8 x 10 and about 6 feet high, and was constructed differently from the first, being very small at the top. These pens existed long enough for the earth above them to be packed into large clods, which did not fall into the cavity when the wood decayed but gradually settled, forming an arch. The second arch was about 8 feet in diameter at the bottom and 7 feet high. The cavity was filled with underground moss. There was no evidence that moisture had ever entered the



B. Metzger Mound.—Diagram of horizontal section showing size and shape of basket dumps. Size of section 3 x 6 feet. Colors of the earth found within limits of this diagram were black, light and dark brown, yellow and bluish gray.

little cave. It was perfectly dry with fine dust in the bottom. The moss would blaze when touched with a match. In the central pen the conditions were entirely different. The excavation sunk by the farmers permitted water to penetrate entirely over 15 x 20′ feet of the base of the mound.

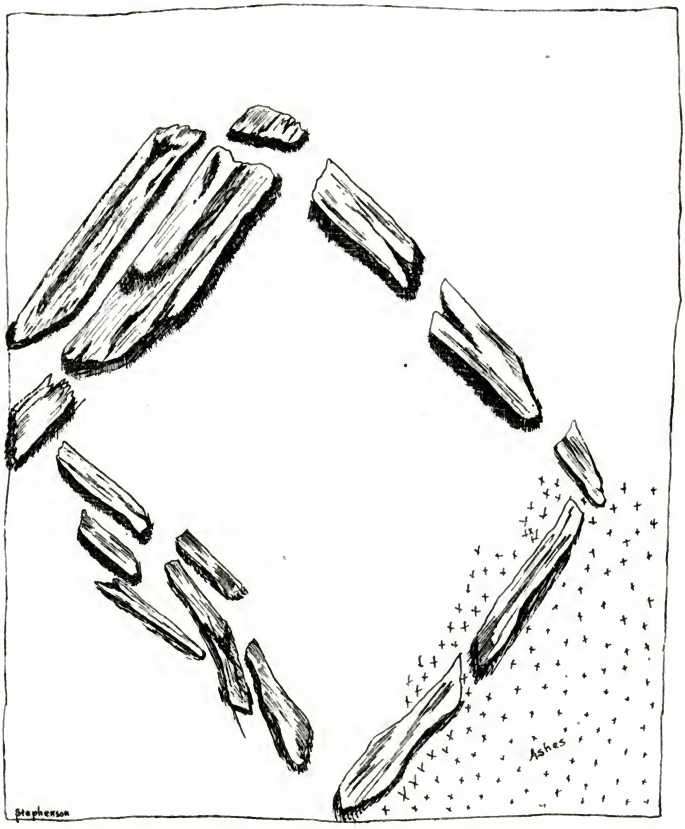
"As the main trench was continued we noticed several small ash pits and patches of dark and also burnt earth. In these were ashes, pottery fragments, animal bones, mussel shells and flint chips. This village site refuse was not considerable.

"Below the upper portion different colors in the mound showed plainly the 'dumps' which contained from a peck to a third of a bushel each. They clearly showed the mound to have been constructed entirely by manual labor, and that about as much earth as could be conveniently carried by one person was deposited in each load. The drawing *B* shows the section, three by six feet, which has been carefully 'scalped' and smoothed to bring out the shades.

"The trench at this point was about forty-five or fifty feet in width and was level throughout. The last three or four feet taken out by the teams were removed from the center, and when the shovellers began, the trench dipped from either end to the center. In working to the original base line a large bed of ashes was uncovered. The log pen itself extended 12 feet east and west to 15 feet north and south. The statement of the original excavators we can hardly verify. It appears that the pen was composed of smaller logs than they state. Two large logs have left a broad, thick strip of decayed wood on the narrowest side of the pen. One corner of the pen ran over into the ash pit. The logs at the southeast corner seem to have been somewhat larger than the others, and were badly decayed, but we managed to dig around them and bring them into relief. Drawing *C* shows the pen as far as we were able to trace it.

"There were here and there fragments of red pottery. About one foot below the remains of the logs were original yellow clay and shale clay the natural hill soil. The decayed logs and the reddish earth resulting from their decay would fill four or five barrels. This will give an idea of the bulk which they originally represented. It was our opinion from the excavation that most of the logs were saplings, and that the pen was not as large as claimed by the original explorers. While as large north and east it certainly was not more than four feet high.

"The sides of the trench were undermined as much as was consistent with safety. It was found that there was nothing in the first



C. Metzger Mound.—Diagram of surface of excavation showing pen two feet above base of mound.

or main trench save the pen described, the refuse, the two fragmentary skeletons, the copper ear button and a few arrow-heads.

The trench was cleaned to the original surface and experimental holes were sunk even to the shale. There were no burials below the original surface.

"The ground had been levelled and burnt, thus giving the mound an even floor or base. In nearly all mounds of the lower Scioto this peculiarity of construction is observed. It is, therefore, very easy to keep upon the base line.

"A bed of ashes was discovered about four feet from the bottom on the northwest side of the trench. In it were bits of charcoal of exceedingly bright lustre and as hard as bituminous coal. The ash bed was everywhere covered with a thin layer of reddish bark. It was impossible to preserve the bark in sections larger than two by three inches. The earth below the ashes was burnt a bright brick red. The ashes varied from three inches in thickness to a feather edge, but a quarter of an inch thick. The earth covered by them extended over ten by six feet.

"It was near the northwestern edge of the ash bed that we found the end of a large log. Numerous small logs were found above and around this large one, but it did not appear that they were laid with any regularity. They did not seem to be as large as those reported by the men who dug the first hole in the mound. Most of them were six or eight inches in diameter, and six feet in length. They were badly rotted and only a few fragments were saved. Possibly by the use of plaster of Paris sections might have been secured several feet in length, but the ends were so decayed that they would not have shown whether or not they were cut by stone axes. As soon as the end of the log was uncovered the men were set to work upon the ash bed with hand trowels, and they dug over the ground very carefully for more than a day but found nothing of importance. The ashes were very white, and resulted from the burning of large quantities of wood.

"When the end of the log was uncovered it appeared to be fifteen or sixteen inches in diameter, and being accidentally struck by a pick, we were rejoiced to hear it ring as though of sound fresh wood. We were compelled to spend three days more and to cut down the bank between the log and the edge of the mound outside so that the teams could pass in and out. By these two excavations (both were widened) we moved two-thirds of the earth in the mound. Near the log the earth on all sides was very loose, and in the form of clods

and large chunks rather than fine soil. It appeared that a circle of saplings had been placed about the log.

"The log must have been cut at a distance and carried to the mound. There is no cedar within ten miles of the structure at the present day, and none was seen by the early settlers. However, it may be that cedar grew upon this hill in pre-Columbian times. The trench extending to the northwest and uncovering the log was 35 feet in width and something over 100 feet in length.

"On Tuesday, September 4th, the excavation reached the bottom of the log, and measurements gave its length as 18·5 feet with a circumference of 5·4 feet. Immediately below the log was a skeleton. The saplings or small logs constructing the pen had been planted in the earth around this skeleton, somewhat after the form of a tepee. The skeleton itself lay upon the original shale in an excavation two feet below the surface of the ground. It was 20 feet from the slope of the mound directly above or 36 feet below the level of the summit. The skeleton lay with head to the north, arms at the sides, and legs extended. Around each wrist were two copper bracelets. At the neck and upon the chest were several hundred shell beads. There were also the tusks of some large animal. The dry ashes with which the remains were covered, and the great depth from the surface aided in the preservation of such substances as usually decay. Traces of hair were about the skull, the brain,[6] dried and shrivelled, was found within it, and cloth, buckskin and rude matting and bark covered the remains. All of these were carefully removed and boxed.

"A rough count made on the spot gave the number of beads as 480.

"After removing the skeleton the log was sawed into two sections and carried out and shipped. The outline of the pen was photographed and drawn, and the whole base of the trench down to the original shale carefully dug over. The loose and partly arched earth on either side of the trench was carefully taken out. The possible presence of other pens in the mound was settled in the negative. The sides were undermined at considerable risk and the walls were allowed to fall. Another inspection showed the absence of other burials in the structure.

[6] This remarkable preservation of the brain is as yet unexplained, though a number of authorities have been consulted. A paper will be devoted to it.—C. B. M.

"Subsequently work of filling up began, and when completed the mound stood about 15 feet in height, flat on top and about 250 feet base.

"The crescent and the small mounds near it were carefully opened but nothing of importance was discovered. Three holes were dug in the crescent, one at each end and one in the center. The crescent averaged three feet in height, was 118 feet across from end to end, 10 feet in width and 250 feet around. There is no evidence of a considerable village site near either of the mounds or the crescent.

WARREN K. MOOREHEAD."

NEW SPECIES OF FUNGI FROM VARIOUS LOCALITIES.

BY J. B. ELLIS AND B. M. EVERHART.

* HYMENOMYCETES.

Crepidotus albidus E. & E.

On bark of (*Tilia*)? Ann Arbor, Mich., May, 1894 (A. J. Pieters).

Pileus resupinate-sessile, nearly white, glabrous, ½–¾ cm. across, margin incurved when dry. Lamellæ not crowded, thin, broad for the size of the plant, pallid, becoming yellowish-brown, radiating from a lateral point, spores yellowish-brown, subinequilaterally elliptical, about 5 x 3½μ.

Polyporus pachycheiles E. & E.

On the side of a rotten maple (*Acer rubrum*) stump, Newfield, N. J., Nov. 1893.

Imbricated, small, 1½–2 cm. wide, 1 cm. long, milk-white at first, margin soon turning yellow, mostly narrowed behind, the pilei connected by a resupinate layer, surface apparently velutinous but not tomentose, hardly depressed behind. Pores minute, 2–3 mm. long, 120–150μ wide, round or by the splitting of the walls, here and there subsinuate, margins even, not lacerate-toothed. Flesh of pileus thin, not over 1 mm. thick and like the pores and the whole plant tough-cartilaginous. Surface of pileus faintly zonate toward the margin, more distinctly so in drying. The pores are nearly as long in front as behind, thus thickening the margin of the pileus, hence the specific name.

Poria inermis E. & E.

On dead shrubs and limbs of various deciduous trees, Newfield, N. J. Received also from Michigan, Canada, Nebraska and Louisiana. Issued in N. A. F., No. 313, as *Polyporus obliquus*, from which it is quite distinct.

Resupinate, adnate, seriate, extending along the limb for six inches or more and about one inch wide, yellowish-brown, 2-4 mm. thick in the middle, margin thin, narrow, light-yellow (when fresh) and closely adnate. Pores small, round, extending down to the underlying wood. Spores ferruginous, sub-globose, 4–5μ diam.

Mucronoporus fulvidus E. & E.

On dead limbs of *Alnus*, Berkeley, Cala., Jan., 1894 (W. C. Blasdale, No. 181).

Resupinate, adnate, tawny-yellow, extending along the limb for 6–8 or more centimeters and 3–4 cm. wide, margin velvety tomentose, narrow, sterile, adnate. Pores short (1 mm. or less), round, extending down to the matrix without any distinct subiculum. Spores hyaline, sub-globose, about 2μ diam. Spines tolerably abundant, 25–35 x 3–4μ, rather pale.

Has the aspect of *Poria inermis* E. & E., but surface of pores more uneven, and spiny within.

Hydnum Washingtonianum E. & E.

On the ground in deep coniferous woods, Tracyton, Kitsap Co., Wash., Dec., 1893 (Adella M. Parker, No. 214).

About 4 cm. high, pale orange, carnose, subviscose. Stipe central, 3 mm. thick, subattenuated below. Pileus about 4 cm. across, slightly depressed in the center, thin, glabrous, wrinkled when dry. Aculei subulate, cylindrical, 3–5 mm. long, pale yellow, nearly white when fresh, decurrent half way down the stem. Spores angular-globose, (white)?, 6–7μ diam., borne on clavate-cylindrical basidia 20–22 x 6μ, with 4 erect, slender sporophores about 6μ long.

From *H. repandum*, to which it is closely allied, it differs in its decurrent aculei and tougher substance.

Tremellodon pusillum E. & E.

On rotten wood, among coniferous trees, Tracyton, Wash., Dec., 1893 (Adella M. Parker, No. 212).

Small, stipitate, gelatinous, white and nearly transparent. Pileus subreniform, membranaceous, 1–1½ cm. across, smoky-brown above and sparingly clothed with weak, pale hairs. Teeth not crowded, white, subcompressed, about ½ mm. long, narrowed gradually from the base, with a few obtuse, short, lateral, tuberculiform branches or processes. Spores ovate-globose, 5–6 x 3½–4μ, consisting of a thin, transparent sack containing a single, large globose nucleus. Stipe lateral, cylindrical. slender, equal, hirto-pubescent, 1 cm. long, 2 mm. thick, smoky-brown.

T. hirneoloides B. & C. is a much coarser, stouter plant, with stipe 18 mm. long, 8 mm. thick at the base.

Coniophora capnoides E. & E.

On bark of dead maple, London, Canada, Sept., 1892 (Dearness, No. 2,004).

Very thin, purplish, margin of the same color, much resembling outwardly, *Corticium fumigatum*, Thum., only not at all cracked and of a darker color. Spores brownish, smooth, globose, 3–3½μ diam., or short elliptical, 3½–5 x 3–3½μ, borne singly on the apices of short, brown basidia or rather emitted successively from these basidia, in which several spores already formed may be distinctly seen. The subhymenial hyphæ are very scanty, and the bark has the appearance of having been for some time exposed to smoke.

Peniophora Atkinsoni E. & E.

On bark of some deciduous tree, Syracuse, N. Y. (Prof. Geo. F. Atkinson).

Closely adnate, thin, smoky-lilac, or smoky-drab color, surface uneven, 1–3 cm. across. Cystidia subulate-cylindrical, slightly roughened above, 30–40 x 5–7μ, projecting above the hymenium 12–20μ. Spores hyaline, compressed, elliptical when viewed in front, 4–5 x 2–3μ, suballantoid when seen edgewise, 4–5 x 1¼–1½μ.

Corticium alboflavescens E. & E.

On dead, standing trunk of *Kalmia latifolia*, Nuttallburg, W. Va., Feb. 1894 (L. W. Nuttall, No. 365).

At first orbicular, subpezizoid, 1–2 mm. diam., becoming more irregular in shape and 1 cm. or more diam., lower stratum milk-white, consisting of loosely interwoven, branching threads, and extending out beyond the pale-olivaceous or yellowish, membranaceous hymenium so as to form a thin subfimbriate, white margin. Spores abundant, globose, with a single large nucleus, 4–6μ diam., slightly colored.

The hymenium has only a slight tinge of olive and is perhaps better described as light-drab color.

Dacryomyces flabella E. & E.

On a decaying stump, Mercer Island, near Seattle, Wash., Nov., 1893 (Adella M. Parker).

Fan-shaped, deep orange color, gelatinous, 1½–2 cm. broad and high, with a short, lateral stipe, suberect with the opposite margins incurved so as to bear some resemblance to *Peziza onotica* Pers., subtuberculiform, or otherwise irregular in shape when young.

Spores oblong-cylindrical, with an oblique apiculus below, obtuse and rounded above, yellowish, about 7-septate, 15–18 x 6μ, about the same as in *D. stillatus*, from which its fan-shaped form and lateral stipe will readily distinguish it.

* * PYRENOMYCETES.

Capnodium caespitosum E. & E.

On living leaves of *Photinia Japonica*, Pasadena, Cala., July, 1894 (Prof. A. J. McClatchie, No. 748).

Perithecia subulate-cylindrical, simple or branched, 300–400 x 60–70μ, collected into compact, convex-hemispherical clusters 1–3 mm. diam., scattered over the upper surface of the leaf and bristling with the projecting points of the perithecia. There is no mycelium spreading over the surface of the leaf, only a few erect, moniliform threads mingled with the perithecia. Sporidia (sporules)? ovate, 3-septate and sub-hyaline at first, finally submuriform and dark-brown, 12–20 x 7–10μ. We have not been able to make out the asci with any certainty.

Nectria pallida E. & E.

On dead bark of *Carya alba*, Missouri, Oct., 1891 (C. H. Demetrio, No. 276 partly).

Stroma mucedinous, white, forming small (½–1 mm.) white tufts, or subeffused. Perithecia 6–20 on a stroma, globose or slightly ovate-globose, minutely pulverulent, about 150μ diam., pale-yellow, with the ostiolum obscure. Asci clavate-cylindrical, sub-sessile, 40 x 6–7μ, paraphysate?. Sporidia biseriate or obliquely uniseriate, oblong-fusoid, 3–4-nucleate, hyaline, apparently becoming uniseptate but not constricted, 6–8 x 2–2½μ.

Sometimes the perithecia stand singly or 2–3 together on scattered shreds of the white, mucedinous stroma.

Venturia vaccinii E. & E.

On dead leaves of *Vaccinium ovatum*, Seattle, Wash., Dec., 1893 (C. V. Piper, No. 225).

Perithecia hypophyllous, scattered, astomous, globose, 80–100μ diam., rather sparingly clothed with stout, straight, black spines 30–60μ long. Asci lanceolate, 25–35 x 6–7μ, 8-spored. Sporidia biseriate, fusoid, hyaline, subinequilateral, faintly uniseptate, 10–12 x 2–2½μ.

Chaetomium pallidum E. & E.

On an old yeast-culture, made on a piece of carrot, London, Canada, March, 1893 (J. Dearness, No. 2,245).

Perithecia superficial, thin membranaceous, pale, ovate, 150–200μ diam., with a conic-papilliform ostiolum. Asci not distinctly made out, but judging from the arrangement of the sporadia, oblong-clavate 30–35 x 10–12μ. Sporidia biconical, brown, becoming nearly opake, 14–18 x 10–12μ, narrowed and obtusely apiculate at the ends.

Differs from the usual type of *Chaetomium* in its pallid perithecia sparingly clothed with spreading white hairs, but by exposure and age the color of the perithecia becomes darker.

Lasiosphæria hystrix E. & E.

On decaying limb of *Salix*, Ohio (Morgan, No. 1,021).

Perithecia gregarious, depressed-hemispherical, $\frac{1}{3}$–$\frac{1}{2}$ mm. diam., clothed all over except the broad, tuberculo-papilliform ostiolum, with straight, spreading, stout, snuff-brown hairs 100–250μ long and 6–7μ thick at the base. The matrix is also overrun with a subiculum of finer, interwoven, branching hairs. Asci clavate-cylindrical, short-stipitate, paraphysate, 8-spored, 120–160 x 20μ. Sporidia lying parallel in the asci, fusoid-cylindrical, hyaline, multinucleate, becoming 7–15-septate, nearly straight, ends obtuse, 45–65 x 8–10μ.

Comes nearest *L. caesariata* C. & P., but that is black and shining and beset with scattered, black hairs; it also has smaller 5–7-septate sporidia.

Rosellinia limoniispora E. & E.

On dead leaves of *Fraxinus*, Rockport, Kansas, Aug., 1894 (E. Bartholomew, No. 1,545).

Perithecia gregarious, superficial, ovate, about $\frac{3}{4}$ mm. diam., often flattened or depressed above, clothed except the black, mammiform ostiolum, with a thin, pruinose-tomentose coat which soon disappears, leaving the surface minutely granular-roughened. Asci (p. sp.) 70–75 x 9μ, with a short stipe, 8-spored, paraphysate. Sporidia obliquely uniseriate, limoniform, (i.e., acutely elliptical), the ends submucronate, 12–15 x 7–8μ, dark-brown.

The absence of any subiculum, and the smaller differently shaped sporidia separate this from *R. medullaris* and *R. mastoidea*.

Rosellinia cæspitosa E. & E.

On dead limbs of *Celtis occidentalis*, Rockport, Ks., Nov., 1893 (Bartholomew, No. 1,252).

Perithecia densely gregarious or cespitose, minute (175–200μ diam.) ovate-globose, rough, with conical or conic-papilliform ostiolum. Asci cylindrical, 60–79 x 8μ when the sporidia lie obliquely, 75–90μ long when they lie end to end, paraphysate, 8-spored. Sporidia uniseriate, rather acutely elliptical, brown, continuous, 9–13 x 6–7μ.

Distinguished by its small, rough, clustered perithecia.

Rosellinia bicolor E. & E.

On rotten wood, Louisiana (Langlois).

Perithecia gregarious, hemispherical, black-brown, ½ mm. diam., thin and fragile, seated on a white subiculum of interwoven, branching hyphae. Asci cylindrical, 125–140 x 8μ, 8-spored, paraphysate. Sporidia uniseriate, broad-fusoid, subinequilateral, 3–4 nucleate, hyaline becoming brown, 20–23 x 6–7μ.

Perithecia only about half as large as in *R. morthieri* Fckl., and not flattened at the apex. Ostiolum minute, papilliform.

Rosellinia ostiolata E. & E.

On bark of *Ulmus Americana*, Rockport, Kansas, Apr., 1894 (Bartholomew, No. 1,429).

Perithecia scattered or subgregarious, superficial, ovate-globose, ¾ mm. diam., black, minutely granular-roughened, slightly narrowed at the base, with a stout, obtuse, short-cylindrical, or conic-cylindrical ostiolum. Asci clavate-cylindrical, 150 x 25μ, paraphysate, 8-spored. Sporidia rhomboid-elliptical, longitudinally rugose, brown, continuous, 25–38 x 20–22μ. Some of them smaller and subglobose, but this may be a deformity.

Rosellinia pinicola E. & E.

On a weather-beaten pine board, Rockport, Ks., Feb., 1894 (Bartholomew, No. 1,379).

Perithecia loosely gregarious, erumpent-superficial, ovate-globose, grayish-black, ¼ mm. diam. Ostiolum minute, papilliform, sometimes slightly compressed. Asci cylindrical, 60–65 x 4½μ, p. sp. 40–45μ long, paraphysate, 8-spored. Sporidia uniseriate, elliptical, 5–8 x 3–4μ, the shorter ones sub-globose, brown, 2–3-nucleate.

Differs from *R. ovalis*, Ell. in its smaller perithecia and sporidia.

Melanomma asterostomum E. & E.

On bark of beech roots, Granton, Ontario, Canada, Jan., 1894 (J. Dearness, No. 2,238).

Perithecia gregarious, ovate-conical, rough, black, ¼–⅓ mm. diam., with a conic-papilliform, often distinctly radiate-sulcate 4–5 cleft ostiolum. Asci clavate-cylindrical, 8-spored, paraphysate, p. sp. 45–50 x 8–10μ. Sporidia crowded-biseriate, oblong-fusoid, 3-septate, often constricted at the septa and one of the inner cells smaller, pale olivaceous-brown (nearly hyaline at first), 12–15 x 3–4μ.

Differs from *M. fuscidulum* Sacc., in the shape of the perithecia and very different ostiolum.

Melanomma moricolum E. & E.

Perithecia gregarious, scattered, semi-erumpent, sub-globose, ⅓ mm. diam., with a minute papilliform ostiolum. Asci clavate-cylindrical, short stipitate, paraphysate, 8-spored, p. sp. 40–45 x 7μ. Sporidia biseriate, oblong-fusoid, slightly curved, sub-obtuse, yellowish-brown, 12–15 x 3–4μ, mostly not constricted, but when mature, some of them distinctly so.

Differs from *M. Mori* H. Fabre, in its much shorter asci and rather smaller biseriate sporidia.

On dead small limbs of *Morus*, Rockport, Kansas (Bartholomew, No. 1,447 partly).

Melanomma alpestre E. & E.

On dead twigs of *Arctostaphylos Nevadensis*, Mt. Paddo, Wash., July, 1886, Alt. 6,000–7,000 ft. (W. N. Suksdorf, No. 268).

Perithecia scattered, hemispherical, 1–1½ mm. diam., carbonaceous, black, glabrous, superficial, flattened, with a minute papilliform ostiolum. Asci cylindrical, short-stipitate, paraphysate, 110–150 x 10–12μ. Sporidia overlapping-uniseriate, or (in the longer asci) lying end to end, oblong-cylindrical, obtuse, slightly curved, 3-septate, brown, 18–22 x 5–6μ.

One perithecium contained two distinct ascigerous nuclei, seeming to indicate that the outer, black shell described above as a perithecium, is in reality a stroma, but the material was too scanty to enable us to settle this point definitely and we have, therefore, referred the specc. to *Melanomma*.

Melanomma dealbatum E. & E.

On old decorticated, bleached and weather-beaten cottonwood logs, Rockport, Kansas, Feb., 1894 (Bartholomew, No. 1,369).

Perithecia scattered, erumpent-superficial, black, glabrous, ovate-globose, 200–225μ diam., at length more or less collapsing above. Ostiolum papilliform, minute. Asci oblong-cylindrical, short-stipitate, paraphysate, 75–110 x 10–12μ. Sporidia overlapping uniseriate, or more or less perfectly biseriate, obovate, hyaline, becoming pale-brown, 3-septate, 12–15 x 6–7μ.

Some of the perithecia are sub-elliptical.

Differs from *M. obliterans* B. & Br. in its habitat (on wood of deciduous tree), and its constricted sporidia; from *M. Catillus* Sacc. in the character of the sporidia and smaller perithecia, nor does it seem referable to any other species with 3-septate sporidia.

Trematosphæria vitigena E. & E.

On old, decaying wood of *Vitis rupestris*, Nuttallburg, West Va., Apr., 1894 (L. W. Nuttall, No. 454).

Perithecia gregarious, sunk in the wood all except the obtuse, convex apex, $\frac{1}{2}$–$\frac{3}{4}$ mm. diam., depressed-globose, the buried part rather thin-walled, the erumpent, convex apex thick, solid, like the stromatic shield of *Clypeosphæria*. Ostiolum papilliform, soon perforated. Asci clavate-cylindrical, paraphysate, 8-spored, 86–100 x 10–12μ. Sporidia sub-biseriate, fusoid-oblong, 3-septate, and constricted, sub-acute, pale-brown, 20–25 x 6–7μ.

Trematosphæria Fraxini E. & E.

On dead limbs of *Fraxinus viridis* that had lain for some time in water, Rockport, Kansas, Feb., 1894 (Bartholomew, No. 1,373),

Perithecia scattered, semi-erumpent, small, elliptical (on a horizontal section), 300–500 x 250–300μ, the base sunk nearly to the wood, the erumpent apex closely embraced by the epidermis. Ostiolum papilliform, soon deciduous and then, perithecium perforated. Asci clavate, short-stipitate, paraphysate, 70–80 x 12–15μ, 8-spored. Sporidia overlapping below, biseriate above, fusoid-oblong, brown, 3-septate and constricted at all the septa, often with one cell swollen, slightly curved, 20–27 x 6–8μ.

The specc. of *Sphæria melina* B. & Br. in Rab. F. E., 1835, have perithecia ovate-conical, $\frac{1}{2}$–1 mm. diam. and sporidia uniseriate, 4–6-nucleate, not constricted, straight, 22–30 x 12–15μ and are certainly different from this.

Teichospora (Teichosporella) Ohiensis E. & E.

On hard wood, Ohio (Morgan, No. 1,012).

Perithecia densely gregarious, superficial, grayish-black, rough, ovate-globose, 300–400μ diam, with a broad papilliform, soon perforated ostiolum. Asci cylindrical, short-stipitate, 55–62 x 7–8μ, 8-spored (paraphysate)? Sporidia uniseriate, short-elliptical, yellowish-hyaline, obscurely 1–3-septate and muriform, 10–12 x 6–8μ.

Has the general aspect of *Rosellinia pulveracea* (Ehr.).

Teichospora tuberculata E. & E.

On wood of *Liriodendron*, Ohio (Morgan, No. 1,004).

Perithecia gregarious, superficial, minute, about 300μ high and 200μ broad, ovate-conical, sessile on the flattened base, coarsely tubercular-roughened, black. Ostiolum obtuse, perforated and often 4-sulcate-cleft. Asci clavate-cylindrical, short-stipitate, 110 x 20μ, paraphysate, 8-spored. Sporidia irregularly biseriate, oblong-elliptical, multiseptate and muriform, hyaline at first, tardily becoming brown, slightly constricted in the middle, 19–22 x 11–13μ, ends obtuse.

Distinguished from the other species by the ovate-conical, tubercular-roughened perithecia.

Teichospora amygdaloides E. & E.

On bark of *Salix amygdaloides*, Rockport, Ks., July, 1894 (Bartholomew, No. 1,507).

Perithecia scattered or sub-gregarious, erumpent-superficial, subglobose, 250–350μ diam., soon flattened above and at length more or less collapsed. Ostiolum papilliform. Asci subventricose, subsessile, paraphysate, 8-spored, 75–85 x 18–21μ. Sporidia mostly crowded-biseriate, obovate, about 5-septate and constricted in the middle, with a longitudinal septum running through 2 or more cells, hyaline and uniseptate at first, finally yellow-brown, 20–22 x 10–13μ.

Differs from *T. obducens* (Pers.) in its scattered growth, sub-collapsing and mostly rather smaller perithecia, and shorter asci with crowded sporidia.

Teichospora clavispora E. & E.

On bark of *Negundo aceroides*, Rockport, Kansas, July, 1894 (Bartholomew, No. 1,509).

Perithecia scattered, erumpent-superficial, ovate-globose, rough, 250–300μ diam., with a papilliform ostiolum. Asci clavate-cylindrical, 100–120 x 14–15μ, paraphysate, 8-spored. Sporidia obliquely

uniseriate, clavate or narrow obovate, 8–10-septate and muriform, brown, 30–35 x 10–12μ, narrowed almost to a point below.

Teichospora rhypodes E. & E.

On decorticated *Rhus*, Ann Arbor, Mich., Apr., 1893 (L. N. Johnson, No. 1,545).

Perithecia gregarious, erumpent-superficial, conic-hemispherical, $\frac{1}{3}$ mm. diam., with a papilliform or conic-papilliform ostiolum. Asci cylindrical, 100–110 x 12μ, paraphysate, 8-spored. Sporidia uniseriate, oblong-elliptical, yellow-brown, 6–7-septate, with a more or less perfect longitudinal septum running through several of the cells, 15–18 x 7–8μ, slightly constricted in the middle, ends obtusely pointed. Accompanied by pycnidial perithecia (*Macrophoma rhoina* E, & E.), smaller and depressed, with fusoid-oblong, hyaline sporules 18–22 x 6–7μ.

The ascigerous perithecia are more or less covered below with the remains of the decomposing fibers of the wood and have a dirty look.

Teichospora crossota E. & E.

On the weathered inner surface of elm bark, Rockport, Kansas, Apr., 1894 (Bartholomew, No. 1,437).

Perithecia gregarious, erumpent-superficial, ovate-globose, rough, black, 150–200μ, diam., fringed around the base with short, creeping, brown hyphæ, not collapsing. Ostiolum papilliform. Asci cylindrical or clavate-cylindrical, about 75 x 10–12μ, abruptly contracted below into a short, crooked stipe, paraphysate, 8-spored. Sporidia sub-biseriate, obovate-elliptical, yellow-brown, 3-septate and more or less constricted in the middle, 12–15 x 8–9μ, ends obtuse.

Allied to *T. pygmæa* E. & E., but perithecia gregarious and fringed, and sporidia longer and acute below.

Teichospora piriospora E. & E.

On outer bark of living *Fraxinus viridis*, Rockport, Ks., March, 1894 (Bartholomew, No. 1,233).

Perithecia erumpent-superficial, subglobose, $\frac{3}{4}$ mm. diam., with a papilliform ostiolum. Asci cylindrical, 100–110 x 15–18μ, sub-sessile, paraphysate, 8-spored. Sporidia overlapping-uniseriate, piriform, 6–11-septate and muriform, yellow-brown, 35–45 x 12–15μ, the terminal cells a little paler.

Teichospora nubilosa E. & E.

On outer bark of *Celtis occidentalis*, Rockport, Kansas, Nov. 1893 (E. Bartholomew, No. 1,249).

Perithecia scattered, superficial, ovate, minute, 250 x 220μ, rough, black, with a papilliform ostiolum, at length collapsing above. Asci clavate-cylindrical, 70–75 x 10–12μ, 8-spored, with filiform paraphyses. Sporidia uniseriate, elliptical or ovate, 3-septate and submuriform, constricted at the middle septum, hyaline at first, but soon becoming brown.

The perithecia are mostly seated on a thin, black crust which overspreads the surface of the bark, giving it a clouded appearance.

Pleosphæria corticola E. & E.

On outer bark of *Pinus rigida*, Nuttallburg, West Va., June, 1894 (L. W. Nuttall).

Perithecia scattered, superficial, ovate, 300–400μ diam., carbonaceo-membranaceous, pilose-strigose, hairs 100–200 x 5–6μ, soon opake, very faintly and sparingly septate, here and there collected into closely compacted fascicles resembling stout bristles. Ostiolum papilliform, obtuse. Asci oblong-cylindrical, abruptly short-stipitate, 80–100 x 20–25μ. Paraphysate? Sporidia crowded, acutely elliptical, nearly hyaline at first, becoming olive-brown and 5–7-septate and muriform, but not constricted.

Comes near *P. strigosa* Sacc., but perithecia rather smaller, not depressed, and hairs fasciculate.

Lophiostoma (Lophiosphæra)? asperum E. & E.

On outer bark of *Ulmus Americana*, Rockport, Kansas, June, 1894 (Bartholomew, No. 1,487).

Perithecia scattered, superficial, ovate, tubercular-roughened, except around the prominent, narrow, compressed ostiolum, 400–450μ high, 300–350μ broad, slightly narrowed around the base. Asci clavate-cylindrical, short-stipitate, 90–100 x 12μ, paraphysate, 8-spored. Sporidia uniseriate, mostly overlapping or oblique, yellowish-hyaline, uniseptate and constricted, 18–21 x 7–8μ, ends subacute, or when free obuse and rounded.

Lophiostoma speciosum E. & E.

On bark of *Fraxinus viridis*, Rockport, Kansas, March, 1894 (Bartholomew, 1,406).

Perithecia scattered, erumpent-superficial, globose, grayish-black,

¾ mm. diam., with a narrow, compressed, deciduous ostiolum. Asci clavate-cylindrical, 150–200 x 22–25μ, p. sp. 112–130μ long, paraphysate, 8-spored. Sporidia biseriate, oblong-elliptical, with the ends subacute, olive-brown. 10–11-septate, not constricted, 40–55 x 13–16μ.

Lophidium pachystomum E. & E.

On outer bark of *Populus monilifera*, Kansas (Bartholomew).

Perithecia gregarious, erumpent-superficial, depressed-globose, ¾–1 mm. diam., base slightly sunk in the bark, rounded above at first and without any visible ostiolum, but finally with a stout, short-cylindrical, obtuse, scarcely compressed ostiolum ½–¾ mm. long. Sometimes two or three perithecia are confluent. Asci clavate-cylindrical, 110–120 x 18–22μ (p. sp. 100–110μ), paraphysate, 8-spored. Sporidia biseriate, clavate-oblong or obovate-clavate, 27–50 x 12–15μ, 6–12-septate and muriform, becoming dark-brown, sometimes shriveled and deformed.

Distinguished by its turret-like ostiolum.

Lophidium nitidum E. & E.

On dead shoots of cultivated grapevines, Nuttallburg, West Va., Jan. 1894 (L. W. Nuttall, No. 295).

Perithecia scattered, semierumpent, small (200–250μ diam.), black and shining, subhemispherical, the flattened base immersed in the bark. Ostiolum compressed, thin, narrow, sometimes obsolete. Asci cylindrical, short-(8–10μ) stipitate, about 100 x 10–12μ, paraphysate, 8-spored. Sporidia uniseriate, oblong-elliptical, yellow-brown, 5–7-septate with a longitudinal septum running through two or more cells, 19–22 x 8–10μ, ends mostly rounded and obtuse, not at all or only slightly constricted in the middle.

Lophidium purpurascens E. & E.

On old paper lying by the roadside, Ann Arbor, Mich., March, 1894 (L. N. Johnson, No. 1,564, partly).

Perithecia gregarious, on purplish spots, ovate, 400–450μ diam., the apex emergent and crowned with the obtuse, compressed ostiolum. Asci clavate-cylindrical, 100–150 x 15–20μ, p. sp. 80–100μ long, paraphysate, 8-spored. Sporidia biseriate above, oblong or fusoid-oblong, attenuated towards each end, 7–10-septate, slightly curved, not at all or only slightly constricted, 2 or more of the cells divided by a longitudinal septum, olive-brown, 22–25 x 8–10μ.

Often in some of the asci the sporidia appear shriveled and are nearly opake.

Lophidium confertum E. & E.

On decorticated, decaying limbs of *Fraxinus viridis*, Trego Co., Kansas, Apr. 1894 (Bartholomew, No. 1,457).

Perithecia crowded, superficial, with the base broadly adnate, conical, somewhat shining above, 300–400μ diam. Ostiolum obtusely conical, mostly more or less compressed, with the opening elongated subhysteriform. Asci clavate-cylindrical, 100–110 x 12–15μ, with a short, crooked stipe and abundant paraphyses. Sporidia uniseriate, short-elliptical, pale yellow-brown, 3-septate, obtuse, more or less constricted at the middle septum, coarsely muriform, 12–15 x 10–12μ. Sometimes the sporidia are smaller and darker with a shriveled look. On account of the slightly compressed ostiola this approaches *Teichospora*.

Cucurbitaria borealis E. & E.

On bark of dead limbs of *Salix* sp., Alcove, N. York (C. L. Shear, No. 216).

Perithecia cespitose, 6–12 together in compact groups, 2–3 mm. diam., seated on the surface of the inner bark and loosely surrounded by the ruptured and upturned epidermis, $\frac{1}{3}$–$\frac{1}{2}$ mm. diam., black, rough, subglobose, with a prominent ostiolum soon perforated. Asci cylindrical, short-stipitate, paraphysate, 8-spored, 90–110 x 15–16μ. Sporidia uniseriate or subbiseriate above, elongated ovate-elliptical, about 7-septate and muriform, somewhat constricted in the middle, yellow-brown, obtuse, 20–27 x 12–14μ.

Differs from *C. salicina* Fckl. in its cespitose perithecia and larger, 7-septate sporidia.

Sphærella hypsicola E. & E.

Perithecia scattered or subgregarious, ovate-globose, 80–90μ diam., subcuticular or superficial by the falling away of the epidermis, pierced above with a small round opening. Asci oblong, sessile, fasciculate, 25–35 x 7–8μ, 8-spored. Sporidia crowded-biseriate, oblong or clavate-oblong, scarcely constricted, hyaline, 9–11 x 2$\frac{1}{2}$–3μ.

On dead stems of *Trollius laxus*, Cameron Pass, N. W. Colo., July, 1894, alt. 10,200 ft. (Prof. C. S. Crandall, No. 4).

Sphærella cœrulea E. & E.

On dead stems of *Aquilegia cœrulea*, Junction of Big South and

Cache la Poudre Rivers, Colo., July, 1894 (Prof. C. S. Crandall, No. 11), alt. 9,000 ft.

Perithecia evenly scattered, subcuticular but prominent, depressed-hemispherical, 100–120μ diam., pierced above. Asci fasciculate, aparaphysate, oblong, mostly broader near the base, sessile, 8-spored. Sporidia 2–3-seriate, crowded, clavate-oblong, obtuse, uniseptate and slightly constricted at the septum, 15–20 x 3½–4½μ.

Differs from *S. Aquilegiæ* E. & G. in its depressed perithecia and narrower sporidia.

Didymella Myricæ E. & E.

On dead twigs of *Myrica cerifera*, Kiamensie, Del., July, 1894 (Commons, No. 2,503).

Perithecia scattered, adnate-superficial, depressed-hemispherical, 100–120μ diam., with a papilliform ostiolum. Asci obovate, subinequilateral, sessile, aparaphysate, 40 x 20μ. Sporidia biseriate, oblong, hyaline, uniseptate and strongly constricted at the septum, ends obtuse, each cell 2-nucleate, 20 x 6–8μ. The cells easily separate.

Didymella Physocarpi E. & E.

On dead limbs of *Physocarpus opulifolius*, Nuttallburg, West Va., May, 1894 (L. W. Nuttall, No. 488).

Perithecia gregarious, covered by the pustuliform epidermis, about ¼ mm. diam., white inside, depressed-globose, the papilliform ostiolum barely penetrating the epidermis. Asci clavate-cylindrical, short-stipitate, 85–90 x 10–12μ, paraphysate, 8-spored. Sporidia biseriate, fusoid, 4-nucleate, uniseptate, constricted at the septum, hyaline, 19–22 x 4–5μ, mostly a little curved.

Didymosphæria populifolia E. & E.

On fallen leaves of *Populus angulata*, Shore of Lake Huron, Ontario, Canada, May, 1894 (Dearness, No. 2,263).

Perithecia gregarious, in suborbicular, hypophyllous groups, about 1 cm. across, not on any definite spots, 80–100μ diam., innate, only the subconoid, minute ostiolum projecting. Asci cylindrical, short-stipitate, 65–75 x 8–10μ, 8-spored (paraphysate)? Sporidia uniseriate, oblong, pale brown, uniseptate, slightly constricted, upper cell a little broader, 12–14 x 3½–4½μ.

Pleospora Richtophensis E. & E.

Perithecia thickly scattered, subcuticular, globose or elliptical,

300–400μ diam., finally more or less collapsing, the papilliform ostiolum barely piercing the epidermis. Asci clavate-oblong, short-stipitate, paraphysate, 8-spored, 85–110 x 20–22μ. Sporidia biseriate, oblong-elliptical, 5-septate and muriform, mostly constricted in the middle, yellow-brown, end cells paler and subacute, 25–35 x 12–14μ.

On dead stems of *Helianthus*, Mt. Richtophen, N. W. Colo., July, 1894 (C. F. Baker, No. 238).

Pleospora alpestris E. & E.

On decaying stems of *Trollius laxus*, Cameron Pass, N. W. Colo., July, 1894 (Prof. C. S. Crandall, No. 4, partly).

Perithecia scattered, innate-erumpent, ovate-globose, 250μ diam., with a papilliform ostiolum. Asci thin, evanescent, 150 x 25–30, 2-spored (in the specc. examined). Sporidia oblong-elliptical, or ovate-oblong, 50–65 x 16–24μ, mostly a little constricted in the middle, multi-(9–12-) septate and muriform, deep yellow-brown.

The perithecia have a scanty fringe of coarse, brown, mycelial threads around the base.

This differs from *Pl. polyphragmia* Sacc. in its smaller glabrous perithecia not collapsing, and its larger sporidia with fewer septa.

Pyrenophora Canadensis E. & E.

On sheaths of *Phleum pratense*, London, Canada, July, 1894 (J. Dearness).

Perithecia scattered, buried with the apex erumpent, ovate, 250–300μ diam., the apex, around the scarcely prominent ostiolum loosely clothed with spreading, brown, continuous hairs 50–80 x 5–6μ. Asci cylindrical, 150–190 x 28–32μ (p. sp. 110–120μ). Paraphyses not seen. Sporidia 4–8, oblong-elliptical or ovate-elliptical, nearly hyaline, obtuse, 3-septate, scarcely constricted, when mature one or two of the cells divided by a longitudinal septum, 40–55 x 15–20μ.

Leptosphæria sambucina E. & E.

On dead *Sambucus melanocarpa*, Cameron Pass, Colo., alt. 10,000 ft., July, 1894 (C. F. Baker).

Perithecia buried, ovate-globose, 350–400μ diam., raising the epidermis into pustules which are whitish at first with the minute, black, papilliform ostiolum visible in the center. Asci clavate-cylindrical, 100–120 x 12μ, paraphysate, 8-spored. Sporidia fusoid-cylindrical, slightly curved, uniseptate and constricted at first, finally

6-septate and constricted at the septa, generally with one cell near the middle, swollen, 22–27 x 6–7μ, golden-yellow.

Differs from *L. agnita* Desm. in its broader, golden-yellow sporidia. *L. Sambuci* in Roum. F. Gall. 5960, has 3-septate sporidia.

Leptosphæria papyricola E. & E.

On old pasteboard lying by the roadside, Newfield, N. J., Aug. 1894.

Perithecia gregarious, buried, with the acutely conical ostiolum erumpent, 110–130μ diam., ovate-globose. Asci (p. sp.) 60–70 x 5μ, with a slender stipe 30–40μ long, paraphyses obscure. Sporidia biseriate, fusoid, dull yellow, slightly curved, 3-septate, often constricted at the middle septum with the next cell above swollen, 14–20 (mostly about 15) x 2½–3μ.

Differs from any form of *L. eustoma* (Fr.) in its conical ostiolum and constantly narrower sporidia.

An *Ophiobolus* with asci 110–120 x 5μ, sporidia filiform 80–110 x 1½μ, also occurs on the same matrix.

Ophiobolus fragilisporus E. & E.

Perithecia scattered, erumpent-superficial, ovate-conical, brownish-black, 350–450μ high, 300–350μ thick, narrowed above into the prominent-papilliform or short-cylindrical, black ostiolum. Asci linear, gradually narrowed below, 150–200 x 5–5½μ. Paraphyses filiform, evanescent. Sporidia nearly as long as the asci, yellowish-brown, 1–1¼μ thick, readily separating into joints 8–12μ long.

Allied to *O. rudis* (Riess.), but sporidia only half as thick and perithecia ovate-conical.

On dead herbaceous stems, on overflowed land, Walton Creek, Colorado, July, 1894, alt. 6,500 ft. (Prof. C. S. Crandall, No. 40).

Linospora Brunellæ E. & E.

On living leaves of *Brunella vulgaris*, Columbia River, W. Klikitat Co., Wash., Apr. 1886 (W. N. Suksdorf, No. 267).

Perithecia thickly scattered, amphigenous, buried in the substance of the leaf, but raising the epidermis into little black tubercles about ⅛ mm. diam., and pierced above by the papilliform or short-cylindrical ostiolum. Asci clavate-cylindrical, 80–90 x 12–15μ, 8-spored, (paraphysate)? Sporidia fasciculate, lying parallel, clavate-cylindrical, yellowish-hyaline, 3-septate, not constricted, 55–65 x 3μ.

Hypospila Brunellæ E. & E.

On leaves of *Brunella vulgaris*, Seattle, Wash., Sept. 1892 (C. V. Piper).

Perithecia buried in the substance of the leaf, ½ mm. diam., the base hemispherical-prominent below, the conic-papilliform ostiolum erumpent through the slightly tubercular-elevated epidermis above. Asci clavate-cylindrical, 90–110 x 12μ, 8-spored, with filiform paraphyses. Sporidia cylindrical, crowded, nearly straight, faintly 1–3-septate, obtuse, 55–62 x 3½–4μ.

Anthostomella hypsophila E. & E.

Perithecia gregarious, buried in the bark, globose, black, ⅛–¼ mm. diam., raising the surface of the bark into distinct pustules which are barely pierced by the papilliform ostiolum. Asci cylindrical, 90–110 x 12μ, paraphysate, 8-spored, stipitate. Sporidia uniseriate, narrow-elliptical, deep brown and finally opake, 15–18 x 8–10μ.

On dead stems of *Lonicera involucrata*, Cameron Pass, N. W. Colo., alt. 10,000 ft. (C. F. Baker).

Anthostomella suberumpens E. & E.

On inner surface of loosened elm bark, Rockport, Kansas, Nov. 1893 (Bartholomew, No. 1,244).

Perithecia gregarious, sunk in the bark, with the stout, conical ostiolum and often the apex of the perithecium erumpent, 250–320μ diam., with tolerably thick walls. Asci cylindrical, short-stipitate, 90–110 x 7–8μ, 8-spored, with filiform paraphyses. Sporidia uniseriate, elliptical, brown, becoming nearly opake, 12 x 6–8μ.

Distinguished from other species by its stout, conical ostiolum and suberumpent perithecia, approaching *Rosellinia*.

Diaporthe (Chorost.) stereostoma E. & E.

On dead branches of *Symphoricarpos occidentalis*, Rockport, Kansas, June, 1894 (Bartholomew, No. 1,482).

Stromata scattered or subconfluent, enclosed in a thin, black, subcarbonaceous crust, conical or subpulvinate, 1–3 mm. diam., seated on the wood and covered by the thin bark which is raised into pustules and pierced by the fascicle of stout, black, conic-cylindrical ostiola which are ½–1 mm. long. Perithecia 3–12 in a stroma, subglobose, about ⅓ mm. diam., slightly sunk in the surface of the wood which is marked by a cluster of shallow cup-shaped cavities

when the perithecia are removed. Asci (p. sp.) 45–50 x 7–8μ, clavate-cylindrical, paraphysate, 8-spored. Sporidia biseriate, oblong, 3–4-nucleate, slightly constricted in the middle, obtuse, hyaline, 10–12 x 3½–4μ.

Very distinct from *D. Ryckholtii*, which is also found on *Symphoricarpos*.

Diaporthe (Chorostate) tetraptera E. & E.

On dead limbs of *Halesia tetraptera*, Nuttallburg, West Va., May, 1894 (L. W. Nuttall).

Stroma cortical, 1½–2 mm. diam., surrounded by a black line which does not penetrate the wood. Perithecia 4–12, circinate, ½ mm. diam., sunk to the wood and leaving their impress on its surface but not penetrating it. Ostiola obtusely rounded and perforated, erumpent in a compact fascicle and closely surrounded by the ruptured epidermis. Asci clavate-cylindrical, 75–80 x 12μ. Sporidia biseriate, oblong-fusoid, slightly curved, subobtuse, hyaline, uniseptate and constricted at the septum, each cell with a large nucleus, 19–22 x 5–7μ.

Differs from *D. Halesiæ* E. & E. in its smaller perithecia, not sunk in the wood and its much larger sporidia.

Diaporthe (Chorostate) Halesiæ E. & E.

On dead limbs of *Halesia tetraptera*, Nuttallburg, West Va., May, 1894 (L. W. Nuttall).

Perithecia 4–8, loosely circinate, ¾ mm. horn-color inside, becoming nearly black, sunk in the wood, necks converging with their obtuse, smooth, hemispherical ostiola erumpent in a close fascicle, closely surrounded by the ruptured epidermis. Asci slender, 55–60 x 6–7μ, short-stipitate. Sporidia subbiseriate, fusoid-oblong, hyaline, 2–4-nucleate, becoming uniseptate and slightly constricted, straight, 12–15 x 2½–3μ.

There is no distinct circumscribing line around the stroma, but the inner surface of the bark is uniformly blackened.

Diaporthe Araliæ E. & E.

On dead limbs of *Aralia spinosa*, Nuttallburg, West Va., Feb. 1894 (L. W. Nuttall, No. 312).

Stroma buried in the wood and circumscribed by a penetrating, black line, elliptical, about 5 x 4 mm. Perithecia buried in the stroma, few (6–10) globose, ½–¾ mm. diam., their short-cylindrical,

ostiola projecting from a black, tubercular disk seated on the surface of the wood and perforating the pustuliform-elevated epidermis, but scarcely rising above it. Asci clavate-cylindrical, 40–45 x 5–6μ, paraphysate, 8-spored. Sporidia biseriate, oblong, 4-nucleate, becoming uniseptate and slightly constricted, hyaline, obtuse, 12–13 x 2½–3μ.

Allied to and resembling *D. ocularia* C. & E.

Valsa ribicola E. & E.

On dead *Ribes aureum*, Rockport, Kansas, Aug. 1894 (E. Bartholomew, No. 1,530).

Perithecia circinate, 10–12 buried in the unchanged substance of the inner bark, not penetrating to the wood or circumscribed by any black line, 230–250μ diam., ovate-globose, with slender necks converging, with their rounded, black, finally subumbilicate ostiola erumpent around the margin of a dirty white disk. Asci clavate-cylindrical, about 60 x 8μ. Sporidia biseriate above, allantoid, hyaline, obtuse, moderately curved, 12–15 x 3–4μ. The white disk is only the top of a grayish-white central column around the base of which lie the perithecia, in a circle 1½–2 mm. diam.

This cannot easily be mistaken for *V. ribesia* Karst., which has sporidia only about half as large and differs also in other respects.

Valsa Chionanthi E. & E.

On dead limbs of *Chionanthus Virginica*, Nuttallburg, West Va., March, 1894 (L. W. Nuttall, No. 228).

Perithecia 4–10, globose, ¼–⅓ mm. diam., buried in the unchanged substance of the bark, with convergent necks, terminating in short-cylindrical, obtuse, perforated ostiola erumpent in a close fascicle perforating and slightly raising the bark. Asci clavate, p. sp. 40–45 x 8–10μ, 8-spored, paraphysate? Sporidia allantoid, hyaline, 12–15 x 3½–4½μ, biseriate above.

Spermogonia (*Cytispora Chionanthi* E. & E.) buried in the bark, flask-shaped, ½–¾μ diam., multilocular, the cells soon confluent, the apex erumpent and perforated by a single pore. Sporules allantoid, 4–6 x 1–1½μ, borne on basidia branched above, the branches erect, straight, nucleate, 7–10μ long.

Valsa Diospyri E. & E.

On dead limbs of *Diospyros Virginiana*, Nuttallburg, West Va., Dec. 1894 (L. W. Nuttall, No. 253).

Stroma consisting of the slightly blackened substance of the bark, convex, about 2 mm. diam., not circumscribed. Perithecia 4–10 in a stroma, subglobose, ¼–⅓ mm. diam., necks converging and united above in a small, black disk which perforates the pustuliform-elevated epidermis, but does not rise above it. Ostiola short, conic-cylindrical, with a smooth, round opening, crowded and finally obliterating the disk. Asci clavate-lanceolate, p. sp. 25 x 5μ, 8-spored, paraphysate. Sporidia allantoid, hyaline, 8–10 x 1½–2μ. Spermogonia (*Cytispora*) in the young stroma, multilocular gray inside, opening by a single, central pore. Spermatia allantoid, hyaline, moderately curved, 4–5 x 1½μ.

Valsa etherialis E. & E.

On dead limbs of *Acer rubrum*, Nuttallburg, West Va., Feb. 1894 (L. W. Nuttall, No. 373).

Stromata cortical, thickly scattered, convex, 1–1½ mm. diam. Perithecia 6–12 together, circinate, buried in the unaltered substance of the bark, small, 150–250μ diam., their short necks terminating in an erumpent, compact fascicle of obtuse, black, slighly unbilicate ostiola closely embraced by the epidermis and scarcely rising above it. Asci (p. sp.) fusoid, 15–22 x 4–4½μ, stipitate, 8-spored. Sporidia biseriate, allantoid, hyaline, curved, slender, 5–6 x about 1μ. When well developed, the epidermis is raised into subdiscoid pustules in which the slight protuberances indicate the position of the subjacent perithecia.

V. delicatula C. & E. has fewer, larger perithecia and broader sporidia. *V. microspora* Cke. & Plowr. has also larger perithecia and yellowish sporidia, and the ostiola are more or less distinctly sulcate, indicating its close relationship to *Eutypella*. In *V. etherialis* the sporidia both in and out of the asci are perfectly hyaline.

Eutypella densissima E. & E.

On dead limbs of *Aralia spinosa*, Nuttallburg, W. Va., Feb. 1894 (L. W. Nuttall, No. 363).

Stromata scattered, cortical, depressed-conical, 2–3 mm. diam., not circumscribed, but staining the bark olive-gray. Perithecia numerous, often 50–70 in a stroma, 100–120μ diam., closely packed, their slender necks terminating in obtusely conical, 4-cleft, black, densely crowded ostiola erumpent in a brown disk surrounded by the ruptured epidermis. The disk is soon obliterated, so that only the crowded, black, subshining ostiola are seen. Asci clavate-fusoid, p.

sp. 25–30 x 4μ. Sporidia biseriate, allantoid, hyaline, moderately curved, 8–10 x 1½–2μ.

Eutypella carpinicola E. & E.

On dead limbs of *Carpinus Americana*, Alcove, N. Y., Oct. 1893 (C. L. Shear, No. 190).

Stromata cortical, flat, subconfluent, 1½–2 mm. diam., formed from the scarcely altered, superficial layer of the inner bark, below which the substance of the bark and surface of the wood is uniformly blackened. Perithecia subcircinate, 3–6 together, ½–¾ mm. diam., with thick, coriaceous walls, their short necks erumpent in a small, flattened, tubercular, black disk, which pierces the papilliform-elevated epidermis, and appears like a small black speck on its surface. Ostiola erumpent through the disk, broad, flat, soon stellately cleft. Asci slender-clavate, p. sp. 40–50 x 5μ, or including the slender stipe, 80–100μ long, paraphysate, 8-spored. Sporidia biseriate, allantoid, yellowish, slightly curved, obtuse, 8–10 x 2μ.

The perithecia lie in the superficial layer of the inner bark, and when the epidermis is pulled off, this layer and the imbedded perithecia adhere to and come off with it. The perithecia are then seen to be surrounded by a thin white layer apparently formed from the substance of the bark.

Calosphæria cornicola E. & E.

On dead limbs of *Cornus asperifolia*, Rockport, Kansas, May, 1894 (Bartholomew, No. 1,470).

Perithecia scattered or loosely collected in subvalsiform groups of 3–5, minute, 200–250μ diam., buried in the unchanged substance of the inner bark, covered by the epidermis which is raised into little pustules and pierced by the papilliform ostiola. Asci clavate, 27–32 x 6–6½μ, rounded above and gradually narrowed to the base. Paraphyses linear, nucleate, much longer than the asci. Sporidia biseriate, cylindrical, hyaline, curved, obtuse, 10–12 x 2μ.

Differs from *C. minima* Tul. (also on *Cornus*) in its sporidia twice as long and rather broader. The scattered mode of growth is like that of *C. microtheca* C. & E.

Endoxyla acericola E. & E.

On rotten maple wood, Granton, Ontario, Canada, Jan. 1894 (Dearness, No. 2,235).

Perithecia scattered or subvalsiform-aggregated, globose, black,

300–350μ diam., entirely buried in the unchanged substance of the wood, their short-cylindrical or conic-cylindrical ostiola exserted either singly or in loose fascicles. Asci cylindrical, 130–140 x 12μ (p. sp. 90–110μ), paraphysate, 8-spored. Sporidia uniseriate, oblong-cylindrical, 3-septate and constricted at the septa, obtuse, not curved, brown, apparently roughish, 18–22 x 8–10μ.

Pseudovalsa viticola E. & E.

On dead shoots of *Vitis riparia*, Rockport, Kansas, April, 1894 (Bartholomew, No. 1,454).

Perithecia buried in the unchanged substance of the inner bark, either singly or 2–4 together, globose, soft, ½–¾ mm. diam., raising the epidermis into distinct pustules, which are pierced by the papilliform or tubercular-papilliform ostiolum. Asci cylindrical, short-stipitate, 8-spored, paraphysate, 100–120 x 10–12μ. Sporidia uniseriate, oblong-cylindrical, straight or very slightly curved, obtuse, 3-septate and slightly constricted, 15–20 x 8–9μ, light yellow-brown.

Valsaria allantospora E. & E.

On dead *Negundo aceroides*, Rockport, Kansas, April, 1894 (Bartholomew, No. 1,450).

Stroma cortical, elliptical (in a horizontal section), 4–7 x 3 mm., or subseriate-elongated for 1–2 cm., formed from the substance of the bark which becomes of a lighter color than the surrounding parts, and is limited by a black line which penetrates the wood to the depth of about 1 mm. Perithecia 6–12 in a stroma, globose, black, thick walled, not sunk in the wood, ¾–1 mm. diam. Ostiola erumpent, slightly projecting, conical, black, not sulcate, not crowded, connected by a thin, black crust. Asci clavate, short-stipitate, p. sp. 55–62 x 8–10μ (paraphysate)? Sporidia biseriate, cylindrical, slightly curved, yellowish and 2-nucleate at first, becoming brown and uniseptate, but not constricted, 12–15 x 3–3½μ.

Diatrype celastrina E. & E.

On dead stems of *Celastrus scandens*, Rockport, Kansas, May, 1894 (Bartholomew, No. 1,472).

Stromata scattered, cortical, light wood-color within, depressed-conical, 2–3 mm. diam., raising the epidermis into distinct pustules, ruptured above with a small, elliptical opening by the dark-gray disk. Perithecia 4–12 in a stroma, subcircinate, ovate, about ½ x ¾ mm. diam. Ostiola scattered or erumpent around the margin of the disk,

flat, with an irregularly shaped opening. Asci clavate-cylindrical, 60–70 x 7–8μ (p. sp. 30–35μ long), paraphysate, 8-spored. Sporidia biseriate, cylindrical, smoky yellow-brown, slightly curved, obtuse, 10–12 x 2–3μ. Stroma circumscribed by a black line, which does not penetrate the wood. This can hardly be the *Sphæria dolosa* Fr., said by Schw. to occur on *Celastrus*. It is certainly different from the spec. so labeled in Sydow's Mycotheca Marchica.

Anthostoma formosum E. & E.

On bark of dead *Celtis occidentalis*, Rockport, Kansas, June, 1894 (Bartholomew, No. 1,492).

Stromata scattered, cortical, thick-convex, 2–4 mm. diam., orbicular or elliptical, formed from the scarcely altered substance of the bark. Perithecia 12–20 buried in the stroma but not penetrating to the wood, ovate-globose, with thick, cartilagino-membranaceous walls, black and shining inside, about 1 mm. diam., their slender necks converging, their stout, conic-cylindrical ostiola with smooth rounded tips, erumpent in a close fascicle and projecting, when fully developed for 1 mm. or more, or quite as often, merely raising and rupturing the epidermis, but scarcely rising above it. Asci cylindrical, stipitate, paraphysate, p. sp. 60–70 x 4–5μ. Sporidia uniseriate, oblong, dark brown (subhyaline and nucleate at first), straight, obtuse, 7–10 x 3–4μ.

Anthostoma micrœcium E. & E.

On dead limbs of *Asimina triloba*, Nuttallburg, West Va., Feb. 1894 (L. W. Nuttall).

Stroma cortical, faintly circumscribed, 1–1½ mm. diam., orbicular, convex. Perithecia 4–8 in a stroma, globose, minute (200–250μ), circinate, necks slender, short, converging, with the minute, papilliform ostiola erumpent in a small, black, hemispherical disk, which barely pierces the pustuliform-elevated epidermis, and is closely embraced by it. Asci cylindrical, 80–110 x 8–10μ, paraphysate 8-spored. Sporidia uniseriate, elliptical, brown, continuous, 2-nucleate, 12–14 x 6–7μ.

Distinguished by its very small stroma and perithecia.

Diatrypella prunicola E & E.

On dead limbs of *Prunus Pennsylvanica*, Alcove, N. Y., Feb. 1894 (C. L. Shear, No. 298, partly).

Stroma seated on the inner bark, convex-hemispherical, 3–4 mm.

diam., tobacco-color inside, not circumscribed, crowded above with the dense, flat-topped orbicular or elliptical fascicle of hemispherical, smooth, soon broadly and irregularly perforated ostiola, which raise and pierce the epidermis with an orbicular opening or oftener protrude through transverse cracks. Perithecia irregularly polystichous, small (110–150μ), black and shining inside, numerous, subglobose. Asci clavate-cylindrical, short-stipitate, 65–70 x 8–10μ, polysporous, paraphysate. Sporidia irregular crowded, yellowish in the mass, allantoid, 5–6 x 1μ.

Phyllachora asterigena E & E.

On living leaves of *Aster oblongifolius*, Rockport, Kansas, Aug. 1893 (Bartholomew, No. 1,040). (Stylospores.)

Forming orbicular or elongated, black patches, 2–6 mm. in extent, on the under side of the leaves. Stroma thin, gray inside, surface roughened by the prominent, conic-hemispherical, perforated ostiola. Ascigerous cells numerous, subglobose, about 100μ diam. Sporules oblong or cylindrical, hyaline, uniseptate, slightly constricted at the septum, obtuse, 15–25 x 4–4½μ.

This does not seem to be *Dothidea Haydeni*, B. & C., which is represented as growing on the stems and having "sporidia linear, attenuated at each end."

Dothidea Solidaginis Schw. has a different habit, stromata numerous, scattered, tuberculiform and mostly less than 1 mm. diam.

Hypoxylon occidentale E. & E.

On dead limbs and trunks. Pasadena, Cal. (Prof. A. J. McClatchie).

Stroma hemispheric-tuberculiform, superficial, sessile, 2–10 cm. diam., surface roughened by the large, hemispherical ostiola, and clothed with a thin coat of short, olivaceous hyphæ, bearing globose, ovate, or oblong-cylindrical conidia, nearly hyaline and continuous at first, finally pale brown and 1–3 septate, 4–15 x 4–5μ. Perithecia peripheral, 1–1¼ x ¾–1 mm. Asci cylindrical, 120–150 (p. sp. about 100) x 6–7μ, paraphysate, 8-spored. Sporidia uniseriate, oblong-elliptical, subinequilateral, olive-brown, 14–16 x 6–7μ.

Has the aspect of *Daldinia concentrica*, but not zonate within, the inner substance consisting of a compact mass of radiating, sooty black fibers with a silky luster. The species is allied to *H. malleolus* B. & R., from which it is distinguished by its more prominent ostiola

not surrounded by any distinct annular depression, and by its broader sporidia and the presence of a conidial layer.

Hypoxylon Nuttallii E. & E.

On bark of dead *Magnolia Fraseri*, Nuttallburg, West Va., May, 1894 (L. W. Nuttall, No. 477).

Stromata gregarious, subconfluent, depressed-hemispherical or strongly convex, 3–6 mm. diam., purplish-black, mammillose. Perithecia small (about ½ mm.), scattered irregularly through the stroma, which is rather soft and brownish within. Ostiola crowning the mammillose projections on the surface of the stroma, papilliform, soon deciduous, leaving a round perforation. The asci in the specc. examined had disappeared. Sporidia brown, oblong-elliptical, subinequilateral, 7–8 x 3–4 μ (exceptionally 9 x 5 μ).

Hypoxylon atroviride E. & E.

On bark of dead tree (*Betula* or *Quercus*), Nuttallburg, West Va., Dec. 1893 (L. W. Nuttall, No. 275).

Stroma pulvinate, 1–1½ cm. across, and about 4 mm. thick, orbicular, covered above with a thin (½ mm.) carbonaceous crust, which is soon covered by a dark green layer of the ejected spores, laterally and internally dirty umber color. Perithecia (which constitute the entire inner substance of the stroma) ovate compressed, and including the long, stout neck, about 3 mm. long and 1 mm. broad below. Ostiola papilliform, soon covered and obscured by the ejected sporidia. Asci cylindrical 100 x 3½–4 μ (p. sp. 40–45 long), paraphysate, 8-spored. Sporidia uniseriate, oblong-elliptical, pale brown, under the microscope 2-nucleate, 4½–5½ x 2 μ.

This is a well-marked species. The substance of the stroma, except the superficial, carbonaceous layer, is friable, and in this respect as well as the color resembles *H. Petersii* B. & C., from which, however, in other respects it is very distinct.

Hysterium cedrinum E. & E.

On weather-beaten wood of a white cedar post, Rockport, Ks., March, 1894 (Bartholomew, No. 1,422).

Scattered, erumpent, narrow-elliptical, minute (¼–½ mm.), black, subrugulose, not polished, lips thin, loosely closed, when fresh open exposing the dark-colored disk. Asci oblong, obtuse above, abruptly contracted below into a short stipe, 45–55 x 16–17 μ, paraphysate, 8-spored. Sporidia biseriate, ovate-elliptical, 3-septate, scarcely

or only very slightly constricted, obtuse at the ends, subinequilateral, 18–21 x 7–8μ, the cells uniformly brown, and each with a large nucleus.

Comes near *H. vulgare* De Not. and *H. ellipticum* Fr., but both of these have oblong sporidia, and the former has shining perithecia, besides their different habitat.

Hypoderma tunicatum E. & E.

On dead branches of *Arctostaphylos Nevadensis* Gray, Mt. Paddo, Wash., July, 1886 (W. N. Suksdorf, No. 268).

Perithecia oblong or lanceolate, prominent, 1–3 x $\frac{3}{4}$–1 mm., brownish-black, ends subacute, entirely closed at first, finally opening by an irregularly torn, longitudinal fissure along the top, exposing the pale disk. Asci clavate, 150–200 x 18–20μ, 8-spored, with filiform, branching paraphyses. Sporidia biseriate, hyaline, oblong-elliptical, slightly curved, 3-septate, and including the broad, hyaline envelope, 22 x 8–10μ, the septate body of the spore being about 20 x 3$\frac{1}{2}$–4μ.

On the tips of the branches was found *Melanomma alpestre* E. & E.

Hypoderma Cassandræ E. & E.

On dead stems and branches of *Cassandra calyculata*, Ann Arbor, Mich., April, 1893 (L. N. Johnson).

Perithecia scattered or gregarious, erumpent, elliptical or oblong, 1–1$\frac{1}{2}$ x $\frac{1}{2}$–$\frac{3}{4}$ mm., membranaceo-coriaceous, black, bordered by the ruptured and upturned epidermis, lips thin, incurved and closed when dry so as to hide the grayish-black disk, finally deciduous. Asci clavate, narrowed gradually below into a stipe-like base, 45–60 x 10–12μ above, rounded at the apex, paraphysate. Sporidia biseriate, oblong or oblong-elliptical, hyaline, mostly a little curved, obtuse, continuous, 10–16 x 4–6μ.

Not to be confounded with *Lophodermium* (*Cenangium*) *Cassandræ* (Pk.), which has much longer, linear or filiform sporidia.

* * * DISCOMYCETES.

Barlæa lacunosa E. & E.

On bark, Notre Dame Bay, Newfoundland, May, 1894 (Rev. A. C. Waghorne).

Sessile $\frac{1}{2}$–1$\frac{1}{2}$ cm. broad, orange-color, hymenium deeply lacunose, yellowish-white outside and minutely tomentose, margin undulate and narrowly incurved. Asci cylindrical, p. sp. 70–90μ, 8-spored.

Paraphyses gradually thickened upwards, hyaline, 3–3½μ thick at the apex. Sporidia uniseriate, perfectly globose, hyaline, 8–10μ diam.

Comes near *B. epichrysea* Beck, but asci and sporidia smaller and hymenium lacunose.

Ciboria juncigena E. & E.

On dead stems of *Juncus*, Falcon Valley, Wash., May, 1883 (W. N. Suksdorf, No. 371).

Stipitate, shallow cup-shaped, thin, 4–5 mm. diam., glaucous-pruinose outside, disk wine-colored, subumbilicate. Stipe about 1 cm. long, 1 mm. diam. below, black and longitudinally wrinkled for about ⅔ the way up, flesh-color above, base flattened and attached to the culm but not penetrating it. Asci clavate-cylindrical, about 60 x 4–5μ, paraphysate, 8-spored. Sporidia subbiseriate, allantoid, slightly curved, hyaline, continuous, 7–8 x 1½μ,

Ciboria Johnsoni E. & E.

N. A. F. No. 3,131.

Growing from decaying "thorn apples" (fruits of *Cratægus*), more or less buried in the ground, Ann Arbor, Mich., May, 1893 (L. N. Johnson, No. 626).

Stipe slender, 10–25 mm. long, subundulate, slightly enlarged above into the strongly concave, 3–8 mm. diam., light dirty brown ascoma. Asci cylindrical, short-stipitate, paraphysate, 8-spored. Sporidia uniseriate, mostly overlapping and oblique, sometimes subbiseriate, ovate-elliptical, subacute, hyaline, continuous, 8–10 x 4–5μ.

The disk in drying becomes grayish-white.

Lachnella rhizophila E. & E.

On decaying roots of *Rhus diversiloba*, Columbia River, W. Klikitat Co., Wash., Jan. 1894 (W. N. Suksdorf, No. 306).

Gregarious, subsessile, dirty white, cup-shaped and ½–1 mm. diam. when fresh, contracted and closed when dry, at first subglobose and nearly closed, outside clothed and margin fringed with straight, rough, pale brown (under the microscope), sparingly septate hairs 100–150 x 4μ. Asci cylindrical, short-stipitate, 8-spored. Paraphyses filiform, scarcely thickened above, about as long as the asci. Sporidia overlapping-uniseriate, or biseriate, fusoid, hyaline, 2–3-nucleate, 10–12 x 3μ.

The ascomata remain cup-shaped, with the margin erect. Disk pale, without any distinct shade of yellow.

Lachnella Virginica E & E.

On decaying wood of *Magnolia Fraseri*, Nuttallburg, West Va., Feb. 1894 (L. W. Nuttall, No. 380).

Gregarious, sessile, ¾–1⅕ mm. diam. Disk pallid, concave, nearly closed when dry, margin fringed with brown, septate hairs, 100–125 x 3μ, outside clothed with shorter, reddish-brown hairs. Asci about 50 x 5μ, clavate-cylindrical, short-stipitate, paraphysate, 8-spored. Sporidia subbiseriate, oblong, 6–8 x 1½–2½μ.

Pseudohelotium laricinum E. & E.

On decaying needles of *Larix*, in a "Tamarack Swamp," Northfield, Mich., June, 1893 (L. N. Johnson, No. 657).

Ascomata sessile, thin, almost membranaceous, carnose, orange colored, flat-discoid, 3–5 mm. diam., darker outside and minutely pubescent, margin incurved when dry, beset with short, compound, conical processes formed by the prolongation of the cellular structure of the ascoma. Asci cylindrical, about 75–8μ, with filiform paraphyses, not thickened above, 8-spored. Sporidia uniseriate, oblong-elliptical, obtuse, hyaline, continuous, 8–10 x 4–5μ (mostly about 4μ).

In old, partly weathered specc. the color becomes a lighter orange.

Cyathicula alpina E. & E.

On dead stems of *Pedicularis*, and culms of *Elymus condensatus*, N. W. Colo., July, 1894, alt. 9,500 ft.

Minute, about ¾ mm. high, stipitate, ascomata, shallow cup-shaped when fresh, closed when dry, about ½ mm. diam., disk and margin pallid, structure fibrous, the extremities of the fibers prolonged and subfasciculate so as to make the margin of the ascoma obscurely dentate. Stipe about ¼ mm. high, whitish. Asci clavate-cylindrical, short-stipitate, with filiform paraphyses scarcely thickened at the apex. Sporidia oblong-cylindrical, hyaline, continuous, 8–10 x 1½–2μ. The outside of the cups is more or less farinose and becomes quite dark.

This is very near *Helotium nigrescens* Cke., which lacks the dentate margin, and has larger asci and sporidia, besides being much darker.

Mollisia Gaultheriæ E. & E.

On living leaves of *Gaultheria Shallon*, Seattle, Wash., Dec. 1893 (Adella M. Parker, No. 185, in part).

Spots large (1–2 cm.), orbicular, dirty brown, paler and purple margined above, sometimes irregular in shape and occupying the greater part of the leaf. Ascomata amphigenous, but more numerous below, superficial on paler parts of the spots, small (½ mm. diam.), dark liver-color (nearly black when dry), margin nodulose-dentate or subentire, glabrous, concave. Asci clavate-oblong, 45–55 x 10–12μ, with a short, nodular stipe and filiform, branched paraphyses. Sporidia biseriate, oblong, hyaline, continuous, 10–12 x 3–3½μ, ends obtuse.

Allied to *M. prinicola* E. & E., but differs in several respects.

Tapesia Coloradensis E. & E.

On bark of *Sambucus melanocarpa*, Cameron Pass, Colorado, July, 1894, alt. 10,000 ft. (C. F. Baker, 236, partly).

Ascomata scattered or subgregarious, sessile, seated on the epidermis or on the surface of the inner bark, 1–2 mm. diam., glabrous, nearly black outside, disk glaucous-white, or livid-white at first, becoming nearly black when dry, margin paler, thin and subundulate. Asci clavate-cylindrical, 45–55 x 8–10μ, narrowed below into a short, thick stipe, 8-spored, with stout but evanescent paraphyses. Sporidia biseriate, oblong-cylindrical, smoky-hyaline, often slightly curved, continuous, obtuse, 8–11 x 2½–3½μ.

The ascomata are surrounded by a thin, brown subiculum (more or less distinct), composed of slender pale brown, sparingly septate, interwoven hyphæ.

Allied to *T. fusca* (Pers.).

When dry the opposite sides of the ascomata roll together in a hysteriform manner.

Helotiella pygmæa E. & E.

On old cornstalks, Ohio (Morgan, No. 993).

Gregarious, minute, pallid, yellowish outside, sparingly clothed and margin fringed with pale slender hairs. When moist convex-discoid, ⅓–½ mm. diam., pallid; when dry urceolate and yellowish, attached to the matrix by a central point and by light colored hairs. Asci (p. sp.) about 30 x 6μ (paraphysate?), 8-spored. Sporidia biseriate, fusoid-oblong, hyaline, 4-nucleate, becoming uniseptate, and sometimes slightly constricted, 10–14 x 3–3½μ.

Differs from *H. carnosula* Rehm in its smaller size and absence of any clavate paraphyses.

Helotiella papyricola E. & E.

On old paper lying by the roadside, Ann Arbor, Mich., March, 1893 (L. N. Johnson, No. 1,564, partly). Found also at Newfield, N. J.

Ascomata gregarious, sessile or contracted below into a very short stipe, pale orange, of a soft waxy consistency, discoid when fresh, and 200–300μ diam., subspherical and nearly closed when dry, outside, sparingly furfuraceous, margin fringed with short, spreading hairs. Asci oblong, very short-stipitate, obscurely paraphysate, 8-spored, 25–30 x 12μ, or elongated, 50–60 x 8μ. Sporidia biseriate, cylindric-fusoid, hyaline, slightly curved, subobtuse, 2–4-nucleate, becoming uniseptate, but not constricted, 12–15 x 3μ.

The paper is stained orange-red around the groups of ascomata.

Helotiella major E. & E.

On rotten wood, Ann Arbor, Mich., June, 1893 (F. E. Langdon, Comm. L. N. Johnson, No. 12).

Ascomata gregarious, often subconfluent, sessile, 1–2 mm. diam., dirty orange inside, dirty white outside and sparingly clothed (the whitish margin more densely so) with short, pale, glandular hairs, expanded when mature and fresh, margin incurved when dry, attached to the matrix by spreading, white filaments, which also form a thin subiculum when the ascomata are crowded. Asci oblong-cylindrical, sessile, paraphysate, 8-spored, 65–70 x 7–8μ. Sporidia mostly biseriate, oblong-cylindrical, slightly curved, hyaline, uniseptate, not constricted, 12–16 x 2½–3μ.

H. cornuta (Ell.) is much smaller and has the sporidia apiculate. *H. Nuttallii* E. & E., to which this is closely allied, is also smaller, with the ascomata of fibrous structure, and clothed with longer and much more abundant hairs. Occasionally a spore is 3-septate, but the texture of the ascomata is carnose, not waxy or coriaceous as in *Dermatella*.

Helotiella Nuttallii E. & E.

On rotten wood, Nuttallburg, West Va., March, 1894 (L. W. Nuttall, 397).

Ascomata gregarious, sessile, flat-hemispherical, ½–1 mm. diam., cup-shaped when fresh, contracted and subspherical when dry with only a small round apical opening, orange color throughout, disk watery orange, outside and fringed margin paler. Substance fibrous,

the fibres prolonged above so as to make a marginal fringe of pale yellow, roughish, straight hairs. Asci clavate-cylindrical, sessile, curved 50–60 x 5–6μ. Paraphyses filiform, hardly thickened above, with a series of orange-colored, globose nuclei. Sporidia biseriate, oblong, hyaline, obtuse, uniseptate but not constricted, 8–10 x 2½–3μ.

The outside of the ascomata is slightly hairy so that the specc. might be referred to *Solenopeziza*, if that is really worthy of generic distinction.

Dermatella viticola E. & E.

On dead shoots of *Vitis* (cult.), Nuttallburg, West Va., Jan. 1894, (L. W. Nuttall, No. 295, partly).

Sessile, convex-discoid and pale when moist, concave and flesh-color when dry, and then scarcely projecting above the surface of the bark, ½–¾ mm. diam. Asci clavate-cylindrical, about 70 x 12μ, with filiform paraphyses, 8-spored, subsessile. Sporidia subbiseriate, oblong-elliptical, hyaline, 1–3-septate (3–4-nucleate at first), 15–18 x 6–6½μ.

Belonium arabicolum E. & E.

On dead stems of *Arabis furcata*, Mt. Paddo, Wash., alt. 6–7,000 ft., July, 1886 (W. N. Suksdorf, No. 347).

Ascomata erumpent-superficial, sessile, orbicular, black, 300–400μ diam., subdiscoid, marginate. Asci clavate, 80–100 x 9–10μ, with filiform paraphyses broadly curved at the tips. Sporidia filiform, nucleate (becoming septate)? 40–60 x 1½μ.

Resembles outwardly *Pyrenopeziza atrata* (Pers.).

Tympanis Oxydendri E. & E.

On dead limbs of *Oxydendrum arboreum*, Nuttallburg, West Va., Dec. 1893 (L. W. Nuttall, No. 258).

Cespitose, 3–5 together, erumpent, at length deciduous, black, ½–¾ mm. diam., contracted below into a short, thick stipe, margin subundulate. Asci cylindrical, 110–130 x 15–18μ, including the short stipe. Paraphyses slender, abundant. Sporidia numerous, minute, oblong, hyaline or yellowish, 2½–3 x 1μ.

Allied to *T. fasciculata* Schw., but asci larger and sporidia smaller.

Stictis Vaccinii E. & E.

On dead leaves of *Vaccinium ovatum*, Tracyton, Kitsap Co., Wash., Dec. 1893 (Adella M. Parker, No. 217).

Hypophyllous, gregarious, erumpent, generally on an indefinite,

pale spot which is often visible also on the upper side of the leaf, but often without any spot, orbicular or somewhat irregular in outline ¾–1 mm. diam., with a prominent, light colored, 3–4-cleft margin. Hymenium glaucous white, plane. Asci clavate-cylindrical, sessile, 70–75 x 6μ. Paraphyses filiform, branched at the tips and bearing minute, subglobose, hyaline conidia. Sporidia filiform, multinucleate, hyaline, 50–55 x 1½–2μ.

This is a more robust species than *S. quercifolia* Cke., which also has longer asci and narrower sporidia, but the two are closely allied.

Stictis chrysopsis E. & E.

On dead stems of *Ceanothus integerrimus*, Columbia River, W. Klikitat Co., Wash., Jan. 1894 (W. N. Suksdorf, No. 309).

Ascomata scattered, immersed, exposed above and at first covered with a thin, white membrane, soon open, urceolate, exposing the deep orange-colored disk, 1–1½ mm. diam. Asci cylindrical, 200–225 x 8–10μ. Paraphyses filiform, about as long as the asci, simple, scarcely thickened above, about 1μ thick. Sporidia filiform, multinucleate, nearly as long as the asci, 1½–2μ thick, hyaline, interwoven.

Schizoxylon compositum E. & E.

On dead twigs of *Quercus coccinea*, Newfield, N. J., and on dead twigs of *Symphoricarpos occidentalis*, Rockport, Kansas (Bartholomew).

Ascomata erumpent-superficial, discoid, white pruinose, ¾–1½ mm. diam. Disk, when the white pruinose layer disappears, distinctly olivaceous. Asci fusoid-cylindrical or lanceolate, 150–200 x 8–10μ, 8-spored, short-stipitate. Sporidia linear, 100–150 x 3–4μ. Separating into elliptical or oblong joints 5–8 x 3–4μ.

This differs from all the other species in the excipulum, containing often 2–6 distinct ascigerous nuclei, resembling on a horizontal section, so many imbedded perithecia. The paraphyses are filiform and more or less recurved and branched above.

Sphæropeziza Coloradensis E. & E.

On decorticated stems of *Potentilla fruticosa*, North Park, Colo., July, 1894 (Prof. C. S. Crandall, No. 30).

Ascomata scattered, erumpent-superficial, about ¾ mm. diam., subglobose and closed at first, then depressed and dehiscent above, with the fimbriate-lacerate margin incurved. Asci clavate, 45–50 x 5–6μ, sessile and closely surrounded and overtopped by the con-

glutinate paraphyses. Sporidia biseriate, oblong-cylindrical, hyaline, 2–5- (mostly 3-) septate, not constricted, ends rounded, 10–14 x 3–3½ μ.

Patinella macrospora E. & E.

On dead stems of *Geum Rossii*, mountains above Cameron Pass, N. W. Colo., alt. 12,000 ft., July, 1894 (Prof. C. S. Crandall, No. 24).

Ascomata gregarious, discoid, superficial, attached by a central point, olive-black, glabrous, about ¾ mm. diam., disk flat, with a thin, narrow, entire, erect margin. Asci clavate-cylindrical, 100–110 x 15–20 μ. 8-spored. Paraphyses stout, simple, olivaceous above, and enlarged into an obovate, olivaceous head, 6–7 x 5–6 μ. Sporidia uniseriate below, subbiseriate above, elliptical, hyaline, smooth, 2-nucleate, about 20 x 10 μ, apparently not fully matured.

Differs from *P. hyalophæa* Sacc. principally in its much larger sporidia.

Scleroderris orientalis E. & E.

On dead limbs of *Cedrus Libani* (cult.), Newfield, N. J., April, 1894.

Ascomata erumpent, cespitose, obconical, dirty white, small, 300–400 μ diam., pulverulent, closely crowded together, or more rarely single, with much the same habit as *S. pallidula* Cke., and *Dermatea carnea* C. & E. Disk plane or convex, immarginate. Asci clavate-oblong, stipitate, p. sp. 55–60 x 12–14 μ, paraphysate. Sporidia biseriate, oblong, obtuse, straight or slightly curved, 3-septate, not constricted, hyaline, 18–23 x 8–10 μ.

* * * * **SPHÆROPSIDEÆ.**

Phyllosticta lindericola E. & E.

On leaves of *Lindera Benzoin*, Nuttallburg, West Va., Sept. 1894 (L. W. Nuttall, No. 593).

Spots various, punctiform and minute without any definite border or irregular in shape, 1 mm.–1 or 1½ cm. diam., or marginal, forming a narrow strip along the edge of the leaf for half its length, pale brown, nearly the color of weather-beaten wood, with a dark (almost black) border. Perithecia epiphyllous, hemispherical, 100–120 μ diam., covered by the blackened epidermis which is raised into pustules barely pierced at the apex. Sporules oblong-elliptical, hyaline, 4–7 x 2–3 μ.

This differs in almost every respect from *Ph. Linderæ* E. & E.

Phyllosticta Brunellæ E. & E.

On leaves of *Brunella vulgaris*, Seattle, Wash., Sept. 1892 (Prof. C. V. Piper).

Spots rusty brown, of irregular shape, subangular, 3–4 mm. diam., or often much larger, occupying half or more of the leaf, definitely limited but without any distinct border. Perithecia buried in the substance of the leaf, minute, dark colored, scarcely visible. Sporules cylindrical, 3–3½ x ½–¾μ, straight, obtuse, slightly swollen at each end, much like those of *Ph. osteospora* Sacc., which, however, has sporules 6–7 x 1μ.

Phyllosticta ferax E. & E.

On fading leaves of *Lupinus albifrons*, Pasadena, Cal., Apr. 1894 (Prof. A. J. McClatchie, 682).

Spots subindefinite, epiphyllous, dark, dirty brown, more or less confluent, blackening and killing the leaves. Perithecia epiphyllous, abundant, scattered over the spots and over the green parts of the leaf, semiemergent, globose, of rather coarse cellular structure, 110–150μ diam., perforated above. Sporules abundant, hyaline, continuous, 3–4 x 1–1½μ.

Phyllosticta macrospora E. & E.

On leaves of *Liriodendron Tulipifera*, Nuttallburg, West Va., Aug. 1894 (L. W. Nuttall).

Spots few, suborbicular, ferruginous-gray, 3–5 mm. diam., with a narrow, raised, darker border. Sporules oblong-elliptical, hyaline, nucleate, 15–30 (mostly 20–25 x 6–7μ).

Phyllosticta allantospora E. & E.

On leaves of *Cakile Americana*, Sandy Hook, N. J., June, 1892 (F. L. Stevens).

Spots suborbicular, wood-color brown, 3–4 mm. diam., margin broad, greenish, subindefinite. Perithecia epiphyllous, subdiscoid, perforated, 100–110μ diam. Sporules oblong or short-cylindrical, hyaline, obtuse, mostly a little curved, 3–5 x 1½μ.

Phyllosticta Araliæ E. & E.

On leaves of *Aralia spinosa*, Nuttallburg, West Va., Sept. 1894 (L. W. Nuttall, No. 588).

Spots suborbicular, light brown, with the margin a little darker, ½–1 cm. diam. Perithecia epiphyllous, somewhat flattened, 100–150μ diam. Sporules oblong-elliptical, hyaline, 2-nucleate, 10–15 x 5–6μ.

Phyllosticta Aplectri E. & E.

On leaves of *Aplectrum hyemale*, Naaman's Creek, Del., Apr. 1894 (Commons, No. 2,408).

Spots of irregular shape, whitish, with a shaded purple border, 1 cm. diam. Perithecia crowded in the spots, erumpent, depressed-globose, 75–90μ, with a distinct papilliform ostiolum, of a coarse cellular, dark olivaceous texture. Sporules elliptical, hyaline, 6–9 x 5μ, filled with small nuclei. Accompanied by *Fusicladium Aplectri* E. & E. on the same spots.

Phyllosticta rhoicola E. & E.

On leaves of *Rhus Toxicodendron*, Nuttallburg, West Va., Aug. 1894 (L. W. Nuttall, No. 567, partly).

Spots 4–6 mm. diam., deciduous, grayish-white, with a narrow black border. Perithecia epiphyllous, scattered, 100–110μ diam., convex-prominent above, visible also below. Sporules narrow-elliptical, hyaline, 2-nucleate, 5–6 x 2–3μ.

Differs from *P. toxica* E. & M. in its larger deciduous spots with a narrow border, and its narrow-elliptical sporules.

Phyllosticta Anemonis E. & E.

On leaves of *Anemone Pennsylvanica*, Ann Arbor, Mich., Oct. 1893 (Harriet L. Merrow).

Perithecia gregarious, hypophyllous, depressed-globose, erumpent-superficial, 90–110μ diam., subastomous, on light brown, dead looking areas of the leaf, more or less distinctly bounded by the veinlets. Sporules short-cylindrical, slightly curved, obtuse, 5–7 x 1½μ.

This is different from *Phyllachora Anemonis* (Fr.), which is found both on the petioles and leaves, and has the characteristic stromata of the Dothideaceæ, the single stromata being about twice as large as the perithecia of our *Phyllosticta* and each containing (sec. spec. in F. G. 192) 3–6 ascigerous cells.

Phyllosticta Quercus-Prini E. & E.

On leaves of *Quercus Prinus*, Nuttallburg, West Va., July, 1894 (L. W. Nuttall, No. 542).

Spots orbicular, rusty brown, definite, with a very narrow border, 2–3 mm. diam. Perithecia epiphyllous, scattered, erumpent, 90–110μ diam. Sporules ovate or oblong, hyaline, mostly a little curved, 5–6½ x 2–2½μ.

This comes very near *Ph. Ludoviciana* E. & E. (J. M. II, p.

130), but in that species the spots are larger, perithecia more prominent below, and sporules rather larger. *Ph. marginalis* E. & E. also has similar sporules but the perithecia are hypophyllous.

Phyllosticta Castaneæ E. & E.

On leaves of *Castanea vesca*, near Nuttallburg, West Va., July, 1894 (L. W. Nuttall, No. 570).

Spots orbicular, rust color, with narrow, dark-shaded margin. Perithecia epiphyllous, scattered on the spots, dark, semierumpent, 100μ diam., often collapsing. Sporules oblong, hyaline, 5–7 x 2–2½μ.

Phoma negundinicola Thum., var. **ramicola** E. & E.

On dead limbs of *Negundo aceroides*, Nuttallburg, West Va., Apr. 1894 (L. W. Nuttall, No. 466), Delaware (Commons).

Perithecia evenly, but not thickly scattered, globose, small, ⅓–½ mm. diam., covered by the slightly ruptured epidermis, but distinctly prominent. Sporules oblong-elliptical, or ovate, hyaline, with a single large nucleus, 10–13 x 4–5½μ.

Differs from the typical form on the dead peduncles, in its broader (2½–3μ) sporules.

Phoma Pennsylvanica E. & E.

On dead limbs of *Acer Pennsylvanicum*, Nuttallburg, West Va., Feb. 1894 (Nuttall, No. 318).

Perithecia numerous, evenly scattered, subepidermal, ⅓–½ mm. diam., whitish inside, raising the epidermis into minute pustules, but scarcely rupturing it. Sporules subglobose, 6–7½μ diam., nearly hyaline.

Phoma pedunculi E. & E.

On old peduncles of *Magnolia Fraseri*, Nuttallburg, West Va., Jan. 1894 (L. W. Nuttall, No. 297).

Perithecia scattered, flattish pustuliform, ½–¾ mm. diam., with a prominent, papilliform ostiolum. Sporules fusoid-oblong, hyaline, 2–3-nucleate, 7–11 x 2–2½μ, ends acute.

Differs from *Stagonospora pedunculi* E. & E. in its larger, flatter perithecia and fusoid-oblong (not cylindrical), rather shorter sporules.

Phoma obscurans E. & E.

On leaves of *Fragaria* (cult.), Nuttallburg, West Va., and Newfield, N. J.

Spots 5–8 mm. diam., with a ferruginous center and broad purple

border, paler below. Perithecia few, scattered, convex-prominent. Sporules oblong-elliptical, hyaline, 2-nucleate, 4½–5½ x 1½–2μ. Basidia simple, lanceolate-fusoid, 8–12 x 1½μ.

Phyllosticta fragaricola Desm. has similar sporules, but (sec. specc. in the various exsiccati), the spots are much smaller, with a white center. The basidia also indicate *Phoma* and not *Phyllosticta*.

Aposphæria alpigena E. & E.

On dead stems of *Sambucus melanocarpa*, Cameron Pass, Colo., July, 1894 (C. F. Baker).

Perithecia scattered, superficial, globose or elliptical, 150–250μ diam., mostly depressed, obscurely papillate. Sporules elliptical, hyaline, enucleate, 3–3½ x 1½μ.

Differs from *A. fuscidula* Sacc. in growing on the bark (not on decorticated limbs), and in its smaller sporules.

Aposphæria pezizoides E. & E.

On decorticated wood of *Platanus, Liquidambar, Fraxinus, Acer, Salix nigra*, and *S. falcata*, Nuttallburg, West Va., April, 1894 (L. W. Nuttall).

Perithecia erumpent-superficial, seriate-aggregate, hemispherical, about ¾ mm. diam., with a distinct papilliform ostiolum, at length collapsing and pezizoid or discoid. Sporules elliptical or ovoid, 4–6 x 2½μ, ends obtuse.

This seems to grow exclusively on abrasions, below high-water mark, made by driftwood on small trees.

Sphæronema Physocarpi E. & E.

On dead stems of *Physocarpus opulifolius*, Nuttallburg, West Va., May, 1894 (L. W. Nuttall, No. 484).

Perithecia gregarious, erumpent-superficial, hemispherical, 150μ diam., with a straight, stout beak 90–115μ long. Sporules narrow-elliptical, hyaline, 2–3-nucleate, 7–9 x 2½μ.

Sirococcus Halesiæ E. & E.

On dead limbs of *Halesia tetraptera*, Nuttallburg, West Va., Feb. 1894 (L. W. Nuttall, No. 376).

Perithecia scattered or 2–3-connate, erumpent, subglobose, about ½ mm. diam., black, with a minute papilliform ostiolum. Sporules subglobose, about 3μ diam., greenish-hyaline, 3–6-concatenate, the terminal sporule oblong and paler. Chains simple, or sparingly branched, arising directly from the proligerous layer without any distinct basidia, collected in stellate clusters.

Pyrenochæte papyricola E. & E.

On old pasteboard lying by the roadside, Newfield, N. J., July, 1894.

Perithecia scattered, subglobose, 100–110μ diam., clothed with black, bristle-like hairs. Sporules subglobose or subelliptical, hyaline, 3–3½μ in the longer diameter.

Placosphæria Arctostaphyli E. & E.

On dead twigs of *Arctostaphylos Nevadensis*, Mt. Paddo, Wash., alt. 6,000–7,000 ft., July, 1886 (Suksdorf).

Stromata erumpent-superficial, pulvinate, ½–¾ mm. diam., flattened and mostly depressed in the center, dotted with punctiform ostiola, closely embraced by the epidermis, multilocular. Sporules oblong-cylindrical, hyaline, continuous, 5–6 x 2–2½μ.

Has the stroma of *Dothidea* producing only stylospores.

Fusicoccum Tiliæ E. & E.

On dead limbs of *Tilia Americana*, Naaman's Creek, Del., Aug. 1894 (A. Commons, No. 2,517).

Stromata scattered, buried, conic-ovate, 250–350μ diam., one-celled, gray inside, raising the epidermis into acute pustules perforated with a round opening. Sporules oblong-fusoid, hyaline, 2-nucleate, 7–10–2½ x 3μ.

Fusicoccum ilicinum E. & E.

On dead limbs of *Ilex opaca*, Nuttallburg, West Va., May, 1894 (L. W. Nuttall, No. 496).

Stromata cortical, convex, about 1 or 1½ mm. diam., multilocular, whitish inside, the tuberculiform apex pierced with a single pore, rupturing the epidermis and slightly raising it. Sporules fusoid, hyaline, nucleate, 15–22 x 2½–3μ.

Cytisporella pinicola E. & E.

On bark of limbs of *Abies Engelmanni*, N. W. Colo., July, 1894 (Prof. C. S. Crandall, No. 6).

Stromata erumpent-superficial, verruciform, 1–1½ mm. diam., easily deciduous. Perithecia peripherical. Sporules minute, elliptical, hyaline, 3 x 1½μ, borne on much branched basidia 15–20 x 2μ. The habit is that of *Dothiorella*, but the minute sporules are those of *Cytisporella*.

Cytispora caryigena E. & E.

On dead limbs of *Carya alba*, Nuttallburg, West Va., May, 1894 (L. W. Nuttall, No. 513).

Stroma cortical, convex, 1½–2 mm. diam., slaty black, 4–6-celled, cells yellowish-white, subglobose, small. Sporules allantoid, hyaline 3½–4½ x ¾–1 μ.

(Spermogania of *Valsa caryigena*, B. & C.)?

Cytispora exasperans E & E.

On dead limbs of *Acer rubrum*, Newfield, N. J., and on *Acer Pennsylvanicum*, Nuttallburg, West Va. (Nuttall).

Stroma buried in the bark, orbicular, about 1 mm. diam., 4–6-celled (at length one-celled), prolonged above into a stout, conical beak opening by a single round pore at the apex. Sporules oblong or allantoid, hyaline, 5–7 x 1½ μ.

Cytispora Celtidis E. & E.

On dead limbs of *Celtis*, Nuttallburg, West Va., Feb. 1894 (L. W. Nuttall, No. 314).

Stroma valsoid, flat, thin, 1½–2 mm. diam., only penetrating the surface of the bark, multilocular, gray inside, raising the bark into small pustules and finally rupturing it, cells resembling perithecia. Sporules allantoid, 6–7 x 1–1½ μ.

Cytispora phlyctænoides E. & E.

On dead limbs of *Corylus Avellana*, Newfield, N. J., June, 1894.

Stromata cortical, conic-convex, 1–1½ mm. diam., indistinctly multilocular, pale inside, with the enclosing layer darker, raising the epidermis into numerous small pustules which are soon ruptured, opening mostly through a single pore. Sporules fusoid, hyaline, 2-nucleate, 6–9 x 2–2½ μ, straight. Basidia simple, attenuated and curved above, about 20 x 1½ μ, resembling the sporules of *Phlyctæna*.

Cytispora Negundinis E. & E.

On dead limbs of *Negundo aceroides*, Rockport, Kansas, April, 1894 (Bartholomew, No. 1,449).

Stroma cortical, conic-convex, 1–1½ mm. diam., slaty black, multilocular, the cells ovate-globose, numerous (15–20 or more), all opening through a single pore in a central column which pierces the epidermis and raises it into little pustules. Sporules allantoid, hyaline, slightly curved, 5½–7 x 1½–1½ μ. On branched basidia 20 μ long.

This is different from *C. macilenta* Rob. and Desm., as shown by a comparison of the specc. From *C. Pseudoplatani* Sacc., it differs in its longer sporules and branching basidia.

Cytispora Halesiæ E. & E.

On dead limbs of *Halesia tetraptera*, Nuttallburg, West Va., May, 1894 (L. W. Nuttall).

Stromata convex-conical, sunk in the bark, orbicular, about 1 mm. diam., white inside, unilocular, the inner surface of the cavity lined with simple, straight basidia about 15μ long, bearing the oblong-fusoid, hyaline, 2-nucleate, straight, 5–7 x 1–1½μ sporules, which are expelled through a single orifice perforating the raised epidermis.

This probably is the spermogonial stage of *Diaporthe Halesiæ* or *D. tetraptera*, both of which are found in company with it.

Sphæropsis Coryli E. & E.

On dead limbs of *Corylus Avellana*, Newfield, N. J., June, 1894.

Perithecia thickly scattered, globose, subcuticular, about ½ mm. diam., raising the epidermis into small pustules which are finally ruptured at the apex with a round or elongated opening. Sporules oblong-elliptical, or the longer ones slightly curved and subcylindrical, 15–20 x 8–10μ.

Sphæropsis Asiminæ E. & E.

On dead limbs of *Asimina triloba*, Nuttallburg, W. Va., Feb. 1894 (L. W. Nuttall, No. 370).

Perithecia scattered or subseriate, buried in the bark which is raised into little pustules over them and soon ruptured. Perithecia small (⅓ mm.), thick-walled, with an obscurely papilliform ostiolum. Sporules oblong-elliptical, brown, obtuse, 18–22 x 8–10μ.

Sphæropsis Neilliæ E. & E.

On *Physocarpus opulifolius*, London, Canada, May, 1893 (J. Dearness).

Perithecia scattered or sometimes 2–3 confluent, small (200μ), covered by the blackened epidermis, semierumpent, with a black, shining papilliform ostiolum. Sporules small, acutely elliptical, or ovate-elliptical, pale brown, 12–16 x 4–5μ.

Sphæropsis Physocarpi E. & E.

On dead *Physocarpus opulifolius*, Nuttallburg, West Va., May, 1894 (L. W. Nuttall, Nos. 482 and 486).

Perithecia scattered, ⅓ mm. diam., buried in the inner bark, with their apices and papilliform ostiola erumpent, white inside (at first), sometimes, as in the preceding species 2–3 confluent. Sporules varying from short-elliptical 12–15 x 10μ, to oblong- or obovate-elliptical 15–20 x 10μ.

Differs from the preceding in its buried perithecia and much larger sporules.

Sphæropsis Ipomœa E. & E.

On dead peduncles of *Ipomœa pandurata*, Nuttallburg, West Va., Dec. 1893 (L. W. Nuttall, No. 249).

Perithecia scattered, ovate-globose, 250–300μ diam., the upper part prominent and closely covered by the shining black epidermis. Sporules elliptical, brown, 18–23 x 10–13μ, on pedicels of about the same length as the sporules.

Coniothyrium infuscans E. & E.

On dead stems of *Valeriana edulis*, Eastern slope of Rabbit Ear Range, Colorado, July, 1894 (Prof. C. S. Crandall, No. 10).

Perithecia densely gregarious, blackening the stems, ovate-globose, membranaceous, black, erumpent-superficial, 170–200μ diam. Sporules globose-elliptical, brown, 6–8μ in the longer diam.

Haplosporella alpina E. & E.

Cameron Pass, Colorado, July, 1894, 10,000 ft. alt. (C. F. Baker, No. 236).

On dead stems of *Sambucus melanocarpa*. Stroma convex-hemispherical, erumpent-superficial, black, 300–400μ diam. Perithecia (cells) buried in the stroma, 100–150μ diam., their papilliform ostiola visible on the surface of the stroma. Sporules globose, 5μ, or elliptical, 6–7 x 5μ, brown.

Apparently the pycnidial stage of some dothideaceous fungus (*Auerswaldia*)?

Haplosporella Araliæ E. & E.

On dead limbs of *Aralia spinosa*, Nuttallburg, West Va., Feb. 1894 (Nuttall, No. 375).

Stromata seriate-connate, erumpent through longitudinal cracks in the bark, and extending from 4–5 mm. to 2 or more centimetres. Perithecia ovate-globose, buried in the black, subcarbonaceous stroma, 3–6 in each single stroma, about $\frac{1}{3}$ mm. diam. Sporules elliptical, brown, 20–25 x 10–12μ.

This may be the pycnidia of *Botryosphæria fuliginosa* (M. & N.).

Haplosporella Celtidis E. & E.

On dead limbs of *Celtis*, West Va., Feb. 1894 (L. W. Nuttall, No. 315).

Perithecia mostly in valsoid clusters of 3–10, small (200μ), white inside, slightly sunk in the inner bark, their papilliform ostiola rupturing the epidermis. Sporules elliptical, brown, continuous, 18–22 x 10–12μ, on basidia of about the same length as the sporules.

Diplodia Kansensis E. & E.

On weather-beaten, bleached bark of *Juniperus Virginiana*, Rockport, Ks., Dec. 1893 (E. Bartholomew, No. 1,292).

Perithecia scattered, subglobose, erumpent-superficial, ⅓–½ mm. diam. Sporules ovate-elliptical, uniseptate, constricted, the septum below the middle, brown, becoming nearly opake, 20–27 x 12–15μ.

Differs from *D. Juniperi* West. and *D. Virginiana* Cke., in its larger ovate sporules.

Diplodia caryigena E. & E.

On dead limbs of *Carya alba*, Canada (Dearness) and West Va. (Nuttall).

Perithecia subseriate, sunk in the inner bark, covered by the epidermis which is raised into pustules and ruptured, about ½ mm. diam., black. Sporules elliptical, brown, uniseptate, scarcely constricted, 15–20 x 8–10μ. (Pycnidia of *Valsa caryigena* B. & C.)?

Diplodia infuscans E. & E.

On bark of dead limbs of *Fraxinus Americana*, Nuttallburg, West Va., May, 1894 (L. W. Nuttall, No. 459).

Perithecia ovate-globose, small, 110–150μ diam., thickly scattered, blackening both the outer and inner surface of the bark. Ostiolum not conspicuous, obscurely papilliform. Sporules oblong-elliptical, 12–15 x 8–10μ, scarcely constricted.

In *D. inquinans* West, the sporules and perithecia are larger, and the bark is not blackened within.

Diplodia Cercidis E. & E.

On dead limbs of *Cercis Canadensis*, Nuttallburg, West Va., Apr. 1894 (L. W. Nuttall, No. 449).

Perithecia subseriate, globose, ⅓–½ mm. diam., slightly sunk in the inner bark and splitting the epidermis with short, longitudinal clefts. Sporules elliptical, 20–23 x 10–15μ, on stout basidia, uniseptate.

Botryodiplodia acerina E. & E.

On dead limbs of *Acer Pennsylvanicum*, Nuttallburg, West Va., Feb. 1894 (Nuttall, No. 319).

Perithecia erumpent in botryoidal clusters often seriately confluent for 1 or more cm., about ½ mm. diam., white inside, flattish above, with a broad papilliform ostiolum. Sporules elliptical, brown, uniseptate, 20–25 x 12–15μ, on basidia of about the same length.

Ascochyta veratrina E. & E.

On dead leaves and petioles of *Veratrum Californicum*, Pullman, Wash., Nov. 1893 (Prof. C. V. Piper, No. 145).

Perithecia scattered, sunk in the substance of the leaf with the apex and conic-papilliform ostiolum erumpent, about ⅓ mm. diam. Sporules cylindrical, obtuse, 3–4-nucleate, becoming uniseptate, hyaline, about 12 x 2½–3μ.

Differs from *A. Veratri* Cavarra (Fungi Langobardiæ, No. 98) in its larger, ostiolate perithecia, not on any spots and in its smaller, straight sporules.

Ascochyta achlyicola E. & E.

On leaves of *Achlys triphylla*, Seattle, Wash., Aug. 1892 (Prof. C. V. Piper, No. 114).

Spots suborbicular or irregular, 3–15 mm. diam., with a dirty white center and a broad, shaded purple margin. The white center is more or less deciduous. Perithecia epiphyllous, innate-prominent, small (75μ), few on a spot. Sporules elliptical, 2-nucleate, hyaline, 5–8 x 2½–3μ, soon becoming uniseptate.

Ascochyta Asclepiadis E. & E.

On leaves of *Asclepias Cornuti*, Pleasant Hill, Del., May, 1894 (Commons, No. 2,420).

Spots amphigenous, suborbicular, ½–1 mm. diam., grayish, with darker zones and a shaded, dark-brown border. Sporules oblong-(or ovate-) elliptical, hyaline, 6–8 x 3μ, becoming faintly uniseptate. Perithecia epiphyllous, innate, black, pierced above, 100–110μ diam.

Hendersonia stygia E. & E.

On decorticated, bleached wood of a cottonwood log, Rockport, Ks., Dec. 1893 (E. Bartholomew).

Perithecia erumpent-superficial, scattered, ovate-globose, ½ mm. diam., or hysteriiform, 1 mm. or more long, at first with a prominent papilliform ostiolum, but soon broadly open above, the upper part finally disappearing, leaving the cup-shaped base filled with abundant sporules and then more resembling acervuli than perithecia. Sporules

ovate-elliptical, subinequilateral, abruptly narrowed at the ends, 3–5-septate, but not constricted, the inner cells nearly opake, the small, terminal cells subhyaline, 12–15 x 6–8μ.

The species is anomalous in the imperfectly developed perithecia, the upper part soon falling away and leaving the cup-shaped base.

Hendersonia falcata E. & E.

On bark of fir trees, Exploits, Newfoundland, Dec. 1893 (Rev. A. C. Waghorne, No. 10).

Perithecia cespitose-erumpent, 6–10 together, united below in a thin stroma, broadly perforated and subcollapsed above. Stromata small (1 mm.), subconfluent and subseriately arranged. Sporules falcate, more abruptly curved or bent above, yellowish-hyaline, granular, becoming 1–3-septate, subattenuated below, on pedicels shorter than the sporules, 20–22 x 5–7μ.

Differs from *Hendersonia rostrata* S. & E. in its stromatic growth and broader, shorter sporules.

Stagonospora petiolorum E. & E.

On dead petioles of *Aralia spinosa*, Nuttallburg, West Va., Feb. 1894 (L. W. Nuttall, No. 357).

Perithecia scattered, innate, small, slightly prominent and covered by the shining, blackened epidermis, 150–250μ diam., mostly-subelliptical. Sporules oblong, hyaline, nucleate, becoming 1- or more-septate, 12–20 x 3–5μ.

Stagonospora Physocarpi E. & E.

On dead stems and limbs of *Physocarpus opulifolius*, Nuttallburg, West Va., May, 1894 (L. W. Nuttall, No. 485).

Perithecia scattered, depressed-hemispherical, 200–250μ diam., sunk in the bark, with the upper part prominent but covered by the epidermis which is pierced by the papilliform ostiolum, white inside. Sporules linear, multiseptate, hyaline, 25–35 x 3–4μ.

Stagonospora Liriodendri E. & E.

On decorticated wood of *Liriodendron Tulipifera*, Alcove, N. Y., June, 1893 (C. L. Spear, No. 304).

Perithecia superficial, evenly scattered or 2–4 subconfluent, obtusely conic-globose, about $\frac{1}{3}$ mm. diam. Sporules cylindrical, hyaline, 8–10 x 2–2½μ, nucleate but not visibly septate, though a central nucleus causes them to appear uniseptate. Basidia slender 25–35μ long, profusely and subverticillately branched.

Camarosporium Celtidis E. & E.

On dead limbs of *Celtis occidentalis*, Rockport, Ks., March, 1894 (Bartholomew, No. 1,400).

Perithecia scattered or cespitose, ovate, ⅓ mm. diam., often seriate, covered by the epidermis at first, with the short-cylindrical, obtuse ostiola erumpent. Sporules oblong, or oblong-elliptical or even cylindrical, brown, mostly 3-septate, 12–15 x 4–5μ, but some of them 5–6-septate, with one or two cells divided by a longitudinal septum, 15–20 x 5–7μ.

There is also a *Teichospora* accompanying, but too scanty to admit of accurate description.

Septoria Echinocystis E. & E.

On leaves of *Echinocystis marah*, Ukiah, Mendocino Co., Cala., May, 1894 (W. C. Blasdale, No. 220).

Spots subangular, limited at first by the veinlets and greenish, becoming light brown with the margin darker, 3–5 mm. diam. Perithecia innate, globose, about 80μ diam., thin, imperfectly developed, brown. Sporules linear, hyaline, nearly straight or subundulate, becoming faintly 1–2-septate, 25–50 x 2½–3μ.

Septoria solanicola E. & E.

On leaves of *Solanum umbelliferum*, Ukiah, Mendocino Co., Cala., May, 1894 (W. C. Blasdale, No. 241).

Spots scattered or confluent, orbicular, 2–3 mm. diam., pale brown with darker border. Perithecia epiphyllous, numerous, pale brown, collapsing, 100–110μ diam. Sporules bacillary, hyaline, faintly nucleate, 20–30 x 1¾–2¼μ.

Differs from the other species on *Solanaceæ* in its shorter, continuous sporules. Roumeguere in F. Gallici 722 has a *Septoria* labeled *S. Solani*, Roum., on *Solanum nigrum*, but the spec. is entirely sterile.

Septoria alnifolia E. & E.

On leaves of *Alnus rubra*, Seattle, Wash., Aug. 1893 (Prof. C. V. Piper, No. 82).

Spots red-rusty brown, orbicular or irregular, mostly with a narrow, dark, raised bordering line, 2–5 mm. diam., more obscure below. Perithecia epiphyllous, innate-prominent, black, minute (80–100μ), not abundant. Sporules linear, hyaline, with a row of nuclei, mostly curved to a semicircle, 35–55 x 3μ.

Of the three described species on *Alnus*, *S. Alni* Sacc. has bacil-

lary sporules, *S. alnicola* Cke. has oblong sporules, and *S. alnigena* Sacc. has no spots.

Septoria solitaris E. & E.

On leaves of *Rhododendron occidentale*, Mill Valley, Cala., July, 1893 (W. C. Blasdale, 172).

Spots amphigenous, round, white with a purple border, numerous, about 2 mm. diam. Perithecia mostly one in the center of each spot, globose, 120–150μ diam., visible on both sides of the leaf. Sporules abundant, bacillary, hyaline, continuous, straight or subundulate or bent, obtuse, about 20 x 2μ.

Septoria Rhododendri Cke. has the perithecia aggregated or circinate and sporules 40μ long.

Septoria Œnanthis E. & E.

On leaves of *Œnanthe sarmentosa*, Seattle, Wash., Aug. 1892 (Prof. C. V. Piper, No. 50).

Spots scattered, small (1–3 mm.), white, subangular, definite. Perithecia few on a spot (3–6), small (75μ), black (yellow-brown under the microscope), subastomous. Sporules fusoid-cylindrical, hyaline, nucleate, 20–35 x 1½–2μ, ends subacute, slightly curved.

Septoria saccharina E. & E., var. **occidentalis.**

On dead leaves of *Acer glabrum*, Fairhaven, Wash., Aug. 1892 (Prof. C. V. Piper, No. 57).

Differs from the type in having the small, white spots, on which the perithecia are seated, not so evenly distributed over the leaf, but collected on rusty brown, yellow-margined, subindefinite spots 3–4 mm. diam.

Septoria circinata E. & E.

On leaves of *Acer circinatum*, Everson, Wash., Aug. 1892 (C. V. Piper).

Spots orbicular, scattered, 2–3 mm. diam., pale yellowish-white, definite but without any distinct border. Perithecia amphigenous, few (4–10), subcircinately arranged around the whitish center of the spots, small, 75μ diam. Sporules abundant, filiform, variously curved and bent, 30–60 x 1½μ, nucleate, but not septate. Seems quite distinct from the other species on maple.

Septoria Tecomæ E. & E.

On leaves of *Tecoma radicans*, Nuttallburg, West Va., Aug. 1894 (L. W. Nuttall, No. 580).

Spots light brown (wood color), irregular in shape, small, 1½–2 mm., inconspicuous and indistinctly margined. Perithecia immersed, small (65–70μ), barely visible with a lens. Sporules 40–50 x 2–2½μ, not strongly curved, nucleate, hyaline.

Septoria Ludoviciana E. & E.

On leaves of *Lactuca Ludoviciana*, Fort Collins, Colo., June, 1894 (C. F. Baker, No. 257).

Spots angular, limited by the veinlets, wood-brown, 2–5 mm. diam., often confluent. Perithecia punctiform, minute, black, epiphyllous, 75–80μ diam., apex erumpent. Sporules cylindrical, more or less curved, obtuse, not septate, 15–25 x 2μ.

Differs from *S. unicolor* Winter, in its lighter colored, angular spots, rather larger perithecia and thicker sporules; differs also in several respects from *S. Lactucæ* Pass. and *S. lactucicola* E. & M.

Septoria Trautvetteriæ E. & E.

On *Trautvetteria palmata*, Nuttallburg, West Va., July, 1894 (L. W. Nuttall, No. 564).

Spots irregular, subangular, partly limited by the veinlets of the leaf, often elongated and acute at one end, brownish-black, with an irregularly shaped white center which is well defined, angular, 3–5 mm. in the longer diam. Perithecia epiphyllous but also visible below, small (65–75μ), scattered, dark. Sporules abundant, nearly straight or slightly curved, continuous, 22–30 x 2μ.

Differs from *S. Anemonis* Desm. in its broad, dark margined, white centered spots and rather longer and thicker sporules.

Septoria Polymniæ E. & E.

On leaves of *Polymnia Uvedalia*, Nuttallburg, West Va., July, 1894 (L. W. Nuttall, No. 543).

Spots scattered, angular, limited by the veinlets, 2–4 mm. diam., dirty green. Perithecia epiphyllous, minute, 75μ diam., scattered, innate, inconspicuous. Sporules filiform, continuous, 35–50 x 1–1½μ.

Septoria hyalina E. & E.

On *Viola lanceolata*, Massachusetts (Miss Clarke); on *V. primulæfolia*, West Va. (Nuttall), and on *V. blanda*, Michigan (Hicks).

Spots minute (½–1 mm.), white, with a dark purple-shaded border. Perithecia punctiform, black, epiphyllous, subglobose, 65–75μ diam., not abundant. Sporules filiform, nearly straight, or slightly curved,

hyaline, nucleate, not visibly septate, 20–40 (mostly 25–35) x 1–1½μ.

S. Violæ West, has yellowish-brown perithecia on pale zonate spots with a reddish-brown border.

Septoria micropuncta E. & E.

On leaves of *Osmorrhiza*, Washington, D. C. (1891)? (E. A. Southworth).

Spots small (1–1½ mm.), subangular, white, with a broad, dark colored border. Sporules cylindrical, slightly curved, not septate or visibly nucleate, 18–27 x 1¼–1½μ.

This is very different from *S. Osmorrhizæ* Pk. which has the spots larger, perithecia also larger, subdiscoid and amber colored, and sporules 35–55 x 2–2½μ, uniseptate.

Septoria Megarrhizæ E. & E.

On leaves of *Megarrhiza Oregana* Benton, Wash., July 14, 1892 (C. V. Piper, No. 112, partly).

Spots orbicular, dirty white, with a broad, dark colored border, 3–5 mm. diam. Perithecia epiphyllous, light colored, innate-subprominent, subastomous, thin, 80–110μ diam. Sporules filiform, nearly straight, hyaline, faintly nucleolate, 40–60 x 2½–3μ.

Phleospora Megarrhizæ E. & E.

Same host and collector as *Septoria Megarrhizæ*.

Spots greenish at first, the central portion (1–3 mm. diam.) becoming dirty white with a faint, dark purple margin. Perithecia epiphyllous, subdiscoid, thin, perforated above, light colored, becoming darker, 150μ diam. Sporules oblong, obtuse, 1–3-septate, hyaline, sometimes narrowed in the middle, 13–27 x 6–8μ.

Distinguished from *Septoria Megarrhizæ*, even without microscopical examination by its much smaller subangular white spots.

Phlyctæna Ipomœa E. & E.

On calyx lobes of *Ipomœa pandurata*, Nuttallburg, West Va., Dec. 1893 (L. W. Nuttall, No. 250).

Perithecia scattered, subcuticular, 75–80μ diam., covered by the blackened, slightly raised epidermis. Sporules linear, hyaline, curved above, 15–20 x 1½μ.

Hysteromyxa corticola E. & E.

On inner surface of old cottonwood bark, Rockport, Ks., Dec. 1893 (E. Bartholomew, No. 1,306).

Perithecia erumpent - superficial, gregarious, membranaceous, yellowish-brown and pustuliform when fresh, collapsing to concave, nearly flat when dry, and then darker colored, the disk or center with a faint, flesh-colored tint, ⅓–½ mm. diam. Sporules globose, 6–8μ diam., yellowish, with a tinge of rose color.

Differs from *H. effugiens* S. & E. in its different habitat and the darker color of the perithecia.

Dothichiza Cassandræ E. & E.

On dead limbs of *Cassandra calyculata*, Ann Arbor, Mich., May, 1894 (L. N. Johnson, No. 1,591).

Perithecia erumpent, surrounded by the ruptured epidermis, ovate-globose and closed at first, ⅓ mm. diam., then irregularly ruptured and subcupulate, ½ mm. diam. Sporules fusoid, hyaline, continuous, straight, acute, 10–14 x 2–2½μ.

Apparently the spermogonia stage of *Cenangium Cassandræ* Pk.

Glœosporium tremuloides E. & E.

On leaves of *Populus tremuloides*, Racine, Wis., Sept. 1893 (Dr. J. J. Davis).

Spots amphigenous, suborbicular, scattered or subconfluent, definite, dark brown, 2–4 mm. diam. Acervuli innate, globose or oblong, 75–85μ diam., dark, erumpent on both sides of the leaf, often covered above by the loosened, silvery epidermis. Conidia elliptical, 10–13 x 5½–6½μ, continuous. *G. Tremulæ*, *G. Sibiricum*, and *G. Populi-albæ*, have fusoid or cylindrical conidia; *G. nævioides* Romell & Sacc. Grev. 21, p. 68, has ovate-oblong conidia, 30–35 x 10–12μ, so that this seems sufficiently distinct from all the other species on poplar leaves.

Glœosporium officinale E. & E.

On leaves of *Sassafras officinale*, Smyrna, Del., June, 1894 (Commons, No. 2,438).

Spots irregular in shape, ½–1 cm. diam., dirty whitish in the center, with the border nearly black. Acervuli minute, numerous, innate, erumpent on both sides of the leaf, but more abundant below, the expelled spores forming little subglobose, pale orange colored subconfluent heaps. Spores oblong or clavate-oblong or ovate, 8–15 x 4–5μ.

This is quite distinct from *Gl. Sassafras* (Cke), (*Gl. affine* E. & K.), in its much larger spores and the different character of the spots.

If, as seems probable, *Phyllosticta affinis* E. & K. in Am. Nat., Nov. 1883, is the same as *Ph. Sassafras* Cke. in Grev., Sept. 1883, the specific name "Sassafras" will have precedence, and "affine," already preoccupied by Saccardo, will be dropped, and *Gl. affine* E. & K. will become *Gl. Sassafras* (Cke.), the fungus being a Glœosporium and not a *Phyllosticta*.

Glœosporium Sanguinariæ E. & E.

On leaves of *Sanguinaria Canadensis*, Nuttallburg, West Va., July, 1894 (L. W. Nuttall, No. 555).

Spots yellow, oblong or irregular, 3–5 mm. diam., situated near the apex of the leaf which is more or less uniformly blackened. Acervuli epiphyllous, numerous, innate, yellow and inconspicuous. Conidia oblong, hyaline, continuous, mostly a little curved, 8–15 x 3½–5½μ.

Glœosporium alboferrugineum E. & E.

On leaves of *Acer saccharinum*, Peoria, Ills., July, 1894 (F. E. McDonald).

Spots numerous, small, subangular, partly limited by the veinlets. 1–2 mm. diam., deep reddish-brown, whitening out. Acervuli 100–150μ diam., hypophyllous, becoming dark. Conidia oblong, hyaline, continuous, 12–14 x 3–3½μ.

Differs from *G. saccharinum* E. & E. in habit and in its conidia twice as long as in that species.

Glœosporium Trillii E. & E.

On leaves of *Trillium sessile*, Berkeley, Cala., April 2, 1894 (W. C. Blasdale, No. 212).

Spots amphigenous, scattered, small (1–2 mm.), dirty white, leaf becoming yellowish around them, finally subconfluent causing the leaf to wither and die.

Acervuli epiphyllous, rather large, yellowish, erumpent, often only one in the center of the spot. Conidia oblong-cylindrical, slightly curved, 10–15 (mostly 10–12) x 2½–3½μ.

Glœosporium serotinum E. & E.

On leaves of *Prunus serotina*, Smyrna, Del., June, 1894 (A. Commons, No. 2,439).

Spots suborbicular, 3–10 mm. diam., deep brick-red, definite, soon confluent covering the entire leaf which is then of a deep red-brick color. Acervuli amphigenous, numerous, flesh color. Conidia oblong, straight, obtuse, 12–15 x 4–5μ.

Differs from *G. prunicolum* E. & E. (J. M. III., p. 129) principally in the much larger conidia.

Myxosporium seriatum E. & E.

On maple bark, Nuttallburg, West Va., June, 1894 (L. W. Nuttall, No. 523).

Nuclei pallid, orbicular, about 1 mm. diam., seated on the surface of the inner bark; surrounded by a thin layer of smoky colored radiating hyphæ from the inner extremities of which the botuliform or oblong, 6–8 x 2–2½ μ, hyaline conidia are produced. The nuclei are seriately arranged, and the pale flesh-colored, flattish cirrhi are erumpent through narrow, longitudinal cracks in the bark.

Myxosporium platanicolum E. & E.

On dead limbs of *Platanus*, Nuttallburg, West Va., April, 1894 (L. W. Nuttall, 467).

Acervuli subcutaneous, vesiculoid, pale, 1 mm. diam., raising the ruptured epidermis into pustules but not erumpent. Sporules oval or oblong-ovate, hyaline, nucleate at first, 10–12 x 5–6 μ, on stout basidia.

Colletotrichum Rhexiæ E. & E.

On leaves of *Rhexia Virginica*, Kimensi, Del., Aug. 25, 1894 (Commons, No. 2,534).

Spots orbicular, small (1–2 mm.), dirty white with a reddish-purple border. Acervuli mostly epiphyllous, sphæriæform, erumpent, 250–350 μ diam., surrounded or clothed with black bristle-like hairs, 60–70 x 3–3½ μ. Sporules oblong, obtuse, binucleate, about 12 x 4 μ, and very short basidia.

Cylindrosporium Cratægi E. & E.

On leaves of *Crataegus*, Nuttallburg, West Va., July, 1894 (L. W. Nuttall, No. 571).

Leaves more or less mottled with rusty red, at length uniformly of this same color. Acervuli innate, erumpent on both sides, and whitening the surface of the leaf with abundantly discharged conidia, which are 75–100 x 3–3½ μ, nearly straight, or more or less undulate and curved, nucleate, and faintly 3–5-septate.

Cylindrosporium ulmicolum E. & E.

On leaves of *Ulmus alata* Starkville, Miss., Nov. 1893 (Prof. S. M. Tracy).

Acervuli numerous, small, pale, buried in yellowish, faded areas of the leaf, visible from above, but erumpent below. Conidia cylindrical, moderately curved, slightly narrowed toward the ends, hyaline, multinucleate, 45–65 x 4μ, expelled in small white tufts, on the lower side of the leaf.

Melanconium stenosporum E. & E.

On bark of *Carya*, Ohio (Morgan, No. 1,002).

Stroma subcuticular, sunk in the surface of the inner bark, orbicular, 1½–2 mm. diam., convex, white inside, but covered by a layer of the narrow, brown, oblong, slightly curved, 13–15 x 3–4μ. Conidia, which are erumpent in black, hemispherical, finally flattened heaps or masses 1–2 mm. diam.

Melanconium acerinum E. & E.

On dead limbs of *Acer macrophyllum*, Pasadena, Cala. (Prof. A. J. McClatchie).

Acervuli buried in the bark, convex, orbicular, 1–1½ mm. diam., raising and rupturing the epidermis. Conidia ovate, nearly opake, 20 x 15μ.

Marsonia Wyethiæ E. & E.

On leaves of *Wyethia glabra*, Santa Rosa, Cala., May, 1894 (W. C. Blasdale).

Acervuli amphigenous, but mostly hypophyllous, small (65–75μ), orbicular, erumpent, nearly white at first, becoming flesh color, crowded in small, angular patches, mostly limited by the veinlets of the leaf, which in these places soon becomes brown, the brown color finally spreading over a great part of, or over the entire leaf. Conidia oblong-ovate, hyaline, uniseptate, scarcely constricted, 18–27 x 10–13μ.

Marsonia Fraseræ E. & E.

On leaves of *Frasera thyrsiflora* Latah Co., Idaho, July, 1892 (C. V. Piper, No. 133).

Spots orbicular, yellowish-brown, ½–1 cm. or more diam., with a broad, dark colored border. Acervuli scattered irregularly on the spots, erumpent above, 150–200μ diam., pale. Conidia oblong-cylindrical, hyaline, uniseptate and more or less constricted at the septum, 12–20 x 5–6μ, ends obtuse.

Marsonia Veratri E. & E.

On leaves of *Veratrum Californicum*, Pullman, Washington, Aug. 1893 (C. V. Piper, No. 158).

Spots amphigenous, small (2–3 mm.), whitish, with a broad, dull-purple border, which is often elongated in the direction of the veins of the leaf for 2–3 cm., with the ends acute, finally more or less confluent, the entire leaf becoming brown and dead. Acervuli small, occupying the centre of the spots, or irregularly scattered over them. Conidia clavate-cylindrical, curved, upper end subtruncate, lower end attenuated and subacute, uniseptate, hyaline, 18–22 x 3–3½μ.

This is not to be confounded with *Cylindrosporium veratrinum* Sacc. & Winter, or with *Ascochyta veratrina* E. & E.

Pestalozzia zonata E. & E.

On decaying fruit of *Cydonia*, Newfield, N. J., Sept. 1890.

Acervuli subepidermal, punctiform, black, raising the cuticle into small pustules, scattered on concentrically zoned, decaying spots on the fruit. Conidia fusoid, 4-septate, slightly constricted at the septa, the two end cells conical and hyaline, the apical one crowned with a spreading crest of three hyaline bristles 15–25μ long, the two cells next below quite dark, so as to obscure the septum between them, the cell next below these nearly hyaline. Pedicels very short.

Pestalozzia Polygoni E. & E.

On living leaves of *Polygonum Virginianum* Stanton, Del., Aug. 1894 (Commons, No. 2,560).

Spots dull brick-red, very irregular in shape and size, mostly elongated 2–10 x 1–4 mm., definite, but without any colored border. Acervuli punctiform, black, suberumpent, epiphyllous, scattered. Conidia cylindrical or fusoid-cylindrical, pale, 3–4-septate and more or less constricted at the septa (which are often indistinct, 18–22 x 4μ, end cells rounded, lower one with a short, slender pedicel, upper one bearing a crest of three, spreading bristles 10–15μ long.

Pestalozzia toxica E. & E.

On leaves of *Rhus Toxicodendron*, Nuttallburg, West Va., Aug. 1894 (L. W. Nuttall, No. 567, partly).

Spots and perithecia as in *Phyllosticta rhoicola* E. & E. Sporules clavate-oblong, 4-septate, 12–15 x 4–5μ, 3 intermediate cells pale brown, end cells short, conical, hyaline, the upper cell with a crest of 3, short, spreading hyaline bristles 6–7μ long. Distance between the two extreme cells 12μ. Pedicels shorter than the spores.

Coryneum cupulatum E. & E.

On dead limbs of *Tsuga Canadensis*, Nuttallburg, West Va., Dec. 1893 (L. W. Nuttall, No. 272).

Erumpent superficial. Acervuli tuberculiform, black, 1–1½ mm. diam., hollowed out so as to be cup-shaped above. Conidia clavate, sessile, 6–9-septate, brown, 60–80 x 12–15μ.

Coryneum abietinum E. & E.

On bark of fir trees, Exploits, Newfoundland, May, 1894 (Rev. A. C. Waghorn, No. 35).

Acervuli erumpent, flat, brownish-black, 1½–3 mm. across, surrounded by the upturned epidermis. Conidia pale brown, fusoid-oblong, 3–4-septate, about 20 x 10μ, on pedicels of about the same length.

* * * * * **HYPHOMYCETES.**

Botrytis torta E. & E.

On dead leaves of *Carex Fraseri*, Nuttallburg, West Va., Dec. 1894 (L. W. Nuttall, No. 257).

Hyphæ simple, sparingly branched, twisted above as in *B. streptothrix* or in *Streptothrix atra* B. & C., brown, 80–100 x 3–4μ, forming numerous small brownish-black tufts, effused or gregarious, on both sides of the leaf. Conidia elliptical, brown, 5–6½ x 3–3½μ.

Differs from *B. streptothrix* (C. & E.) in its much smaller conidia and more dwarfish growth.

Ovularia Vancouveriæ E. & E.

On leaves of *Vancouveria hexandra*, Cazadero, Cala., May, 1894 (W. C. Blasdale, No. 213).

Spots amphigenous, angular, limited by the veinlets, 1–2 mm. diam., dark brown above, paler below. Hyphæ hypophyllous, fasciculate, simple, 30–35 x 3μ, appearing like a white, pruinose coating. Conidia varying from acutely elliptical, to oblong, and from 10–20 x 4–6μ.

Not to be confounded with *O. Berberidis*, Cke.

Ramularia Castilleiæ E. & E.

On leaves of *Castilleia miniata*, Mts. of Skamania Co., Wash., Aug. 10, 1886 (W. N. Suksdorf, No. 288).

On subferruginous, indefinite spots, 2–3 mm. diam. Hyphæ hyaline, simple, mostly thickened above, 15–25 x 3–4μ, arising from a tubercular base from which they project on all sides, forming light flesh colored, sphæriæform tufts and bearing at their tips the narrow-elliptical, oblong, or cylindrical, hyaline, continuous or uniseptate, 15–25 x 3–4μ conidia.

The Ramularia occupies the central part of the spots and is surrounded by subprominent, black, small, immature perithecia with which it appears to be generically connected.

Ramularia Psoraleæ E. & E.

On leaves of *Psoralea macrostachya*, Ukiah, Mendocino Co., Cala., May, 1894 (W. C. Blasdale, No. 221).

Spots small, round, pale rusty brown, 1–2 mm. diam. Hyphæ fasciculate, simple or sparingly branched above, hyaline, becoming brownish, continuous or faintly 1–3-septate, subgeniculate above. Conidia fusoid, hyaline, uniseptate and often slightly constricted, rather abruptly narrowed at the ends, 12–30 x 3–3½ μ.

Ramularia contexta E. & E.

On living leaves of *Menispermum Canadense*, Ann Arbor, Mich., Aug. 1885 (Prof. V. M. Spalding).

Hyphæ slender, hyaline, interwoven, so as to form a thin subseparable, web-like, layer, subangular in outline, 1–2 mm. across, dirty white at first, becoming whiter and thicker. Fertile hyphæ erect, 15–25 x 2–2½ μ, continuous, mostly simple. Conidia clavate-fusoid, hyaline, continuous at first, becoming 1-septate, 8–15 x 2–3 μ.

Has something the aspect of *Erineum*.

Helicoma monilipes Ell. & Johnson.

On oak bark, Ann Arbor, Mich., Oct. 1893 (L. N. Johnson, No. 666).

Cæspitose, in minute, punctiform, brown tufts, about ⅛ mm. diam., appearing under the lens like minute flattened perithecia of about the same color as the bark. Creeping hyphæ nearly obsolete; fertile hyphæ cespitose, erect, nearly hyaline, irregularly or subdichotomously branched above, closely septate and constricted at the septa so as to appear submoniliform, 40–50 x 3–4 μ. Conidia terminal, or becoming lateral by the prolongation of the hyphæ, pale brown, closely and permanently involute, forming a coil 12–15 μ diam., the cylinder or thread which forms the coil being 3–4 μ thick and coiled about 1½ times.

Chætopsis roseola E. & E.

On oak bark, Ann Arbor, Mich., March, 1894 (L. N. Johnson, No. 156).

Mycelium inconspicuous or none. Fertile hyphæ simple, erect, straight, septate, subulate, paler and attenuated above, 200–250 μ

long, brown. Branches issuing from the middle portion of the hyphæ, spreading, simple or 2–3-parted, hyaline at first, becoming brown, 15–30 x 2½ μ, faintly septate, bearing at their tips the cylindrical, hyaline, straight; obtuse, 3–4-nucleate, 8–10 x 1½–2 μ conidia.

The effused hyphæ appear like a thin, pale rose-colored pubescence on the bark.

Closely allied to *C. stachyobola* Sacc., but the color is different, the branches often divided and the hyphæ not perceptibly swollen at the base.

Stachylidium caricinum E. & E.

On dead leaves of *Carex Fraseri*, Nuttallburg, West Va., Feb. 1894 (L. W. Nuttall, No. 335).

Hyphæ fasciculate, brown, septate, 600–700 x 3½ μ, simple or occasionally forked above, towards the top, with short-cylindrical, hyaline branches opposite or in whorls of three, bearing at their tips the elliptical, hyaline, 4–5 x 1½–2 μ conidia, collected into a globose head 10–12 μ diam.

Coniosporium microsporum E. & E., n. sp.

On dead herbaceous stems (*Senecio triangularis*), Medicine Bow Range, Colo., July, 1894 (Prof. C. S. Crandall, No. 23).

Acervuli at first covered by the thin epidermis, soon erumpent, 1–3 mm. diam., black, consisting of a mass of minute (3 μ), globose, olive-brown, conidia.

Torula (Trachytora) sporodesmoides E. & E.

On bark of dead limbs, Pasadena, Cala., Jan. 1894 (Prof. A. J. McClatchie, No. 622).

Pulvinate or subeffused, pulvinuli, hemispherical, sooty black, ½–¾ mm. diam. Creeping mycelium scanty, hyaline at first, sending up short, fertile branches, from which the concatenate conidia are formed by constriction. Conidia elliptical, 8–10 x 5–6 μ, uniseptate but not constricted, yellowish-brown at first, becoming nearly opake and distinctly roughened. Often where 2 or more threads lie in contact, the cells of the different threads become laterally connate, forming irregularly shaped aggregations of conidia resembling *Sporodesmium.*

This differs from *T. dimidiata* Penz. in the uniseptate, rough conidia.

Fusicladium Staticis E. & E.

On living leaves of *Statice Limonium*, Cape May, N. J., Sept. 1894 (Commons, No. 2,565).

Spots orbicular, 2–5 mm. diam., purplish at first, then rubiginous with a purplish border, becoming paler in the center and finally subdeciduous. Hyphæ epiphyllous, fasciculate, 40–60 x 4μ, brown, septate, subgeniculate above. Conidia oblong with the ends obtusely pointed, subolivaceous, 1- (exceptionally 2-) septate, 10–16 x 3–4μ.

The tufts of hyphæ are crowded in the central part of the spots.

Fusicladium Aplectri E. & E.

On leaves of *Aplectrum hyemale*, Naaman's Creek, Del., Apr. 1894 (Commons, No. 2,408).

Spots irregular, whitish, with a shaded, purple border, 1 cm. diam. Hyphæ fasciculate, olivaceous, simple, 2–3-septate, 65–75 x 5–6μ, mostly twisted or abruptly bent at the tips, olive-brown. Conidia terminal, elliptical, greenish, granular, continuous at first, becoming 1-septate, 12–15 x 6–7μ.

Cladosporium aterrimum E. & E.

On rotten wood, Rockport, Ks., Nov. 1893 (Bartholomew, No. 1,256).

At first densely tufted, tufts soon effused, forming an olive-black, velvety stratum 1 or more cm. in extent. Fertile hyphæ slender, sparingly septate, 100–150 x 2½μ, nearly straight, simple. Conidia terminal, at first elliptical, 3–5μ long and continuous, then oblong-cylindrical, uniseptate, 5–7 x 2½μ, ends obtuse. Probably the subiculum of some Pyrenomycete.

C. lignatile Schw. is said to have the hyphæ very short ("brevissimis").

Cercospora (Cercosporella) albomaculans E. & E.

On leaves of *Brassica campestris*, Berkeley, Cala., Feb. 1894 (W. C. Blasdale, No. 201).

Spots suborbicular, white with a narrow, darker margin, ½–1 cm. diam. Hyphæ amphigenous, tufted, short, 8–12 x 2μ, hyaline, continuous. Conidia cylindrical, hyaline, straight or slightly curved, of about equal thickness throughout, 40–65 x 2–2½μ, becoming faintly 3-septate. The tufts are very minute.

Distinguished from the other species on *Cruciferæ* by its large white spots and cylindrical conidia which resemble the sporules of Septoria.

Cercospora (Cercosporella) Fraseræ E. & E.

On leaves of *Frasera speciosa*, mountains west of Bear Valley, Colo., July, 1894 (Prof. C. S. Crandall, No. 65).

Spots large (½–1 cm.), pale brown with a narrow, black border. Hyphæ in scattered tufts, appearing under the lens like minute, pale white granules, continuous, hyaline, 15–20 x 3μ. Conidia gradually attenuated above, hyaline, faintly 1–4-septate, 80–110 x 3–3½μ.

The general appearance is about the same as that of *Marsonia Fraseræ* E. & E., but this is quite a different thing.

Cercospora Borreriea E. & E.

On leaves of *Borreria micrantha*, Biloxi, Miss., July, 1893 (Prof. S. M. Tracy).

Hypophyllous. Tufts effused, forming a thin, olivaceous coating. Hyphæ slender, undulate or crisped and geniculate, 100–120 x 3–3½μ, brown, nucleate and indistinctly and sparingly septate. Conidia slender lanceolate, hyaline, 3–5-septate, 35–45 x 3–3½μ.

Cercospora ribicola E. & E.

On leaves of *Ribes sanguineum*, Seattle, Wash., Aug. 1893 (C. V. Piper, No. 81).

Spots numerous, subangular and partly limited by the veinlets, definite but without any distinct border, red-rusty brown, 2–4 mm. diam. Tufts mostly epiphyllous, sphæriæform, not effused, appearing like small, clustered, superficial perithecia. Hyphæ densely fasciculate, pale brown, continuous, simple 25–35 x 3½–4μ. Conidia lanceolate, hyaline, nucleate and 1–3-septate, 35–80 x 3–4μ.

Quite different from *C. marginalis* Thum. Well characterized by its red-brown spots and sphæriæform tufts of hyphæ.

Cercospora Cirsii E. & E.

On *Cnicus remotifolius*, Skamania Co., Wash., Aug. 1886 (W. N. Suksdorf, No. 291).

Spots dark brown, paler below, suborbicular, 3–5 mm. diam. or by confluence irregular and larger, often marginal, definite. Hyphæ epiphyllous, tufted, the small black tufts thickly covering the spots, short, simple, pale brown, nearly entire, 15–30 x 3½–4μ. Conidia slender, hyaline, 4–6-septate, 50–80 x 3½μ.

Cercospora Baccharidis E. & E.

On *Baccharis Douglasii*, Berkeley, Cala., June, 1894 (W. C. Blasdale, No. 254).

Tufts effused, at first on irregular areas of the green leaf, partly bounded by the veinlets, the part of the leaf occupied soon becoming brown and dead. Hyphæ densely cespitose, simple, hyaline, mostly continuous, 25–40 x 5μ. Conidia cylindrical, hyaline, obtuse at the ends, 1–3-septate, often constricted at the septa. The tufts of hyphæ are of a pale rose color, nearly white and are found on both sides of the leaf.

Cercospora melanochæta E. & E.

On leaves of *Celastrus scandens*, Louisville, Kansas, Oct. 1893 (E. Bartholomew, No. 1,210).

Spots amphigenous, slaty black, with the center whitish and the margin shading off into rusty brown, suborbicular, ½–1 cm. diam. Hyphæ dark brown, septate, subundulate above, 40–60 x 3½–4μ, forming dense sphæriæform, tobacco-brown tufts on the whitish center of the spots on both sides of the leaf. Conidia clavate-cylindrical, brown, 3–5-septate, 40–70 x 4–5μ. The dark part of the spots, especially below is covered with numerous, black, sterile perithecia.

Cercospora columnare E. & E.

On dried up leaves of *Phaseolus* (cult.), Newfield, N. J., Sept. 1894.

Amphigenous but mostly hypophyllous. Hyphæ erect, fasciculate, forming a compact bundle or tuft like *Isariopsis*, 150–230 x 4μ, brown, sparingly septate. Conidia oblong-cylindrical, 1–5-septate, not constricted, brownish, mostly a little curved, 40–60 x 5–6μ.

C. Phaseolorum Cke. is said to have the hyphæ short ("abbreviatis") which can hardly apply to this.

Cercospora Œnotheræ E. & E.

On leaves of *Œnothera biennis*, Nuttallburg, West Va., Oct. 1894 (L. W. Nuttall, No. 599).

Spots irregular, mostly elongated, grayish-brown, subangular, 3–5 x 2–3 mm., subconfluent. Hyphæ amphigenous, subhyaline, continuous or faintly 1–2-septate, 15–20 x 3μ, in minute scattered tufts, few in a tuft, spreading, subundulate. Conidia linear or only slightly attenuated above, smoky-hyaline, nucleate and faintly 3–5- or more-septate, 25–80 x 2–2½μ, straight or only slightly curved.

Cercospora Merrowi E. & E.

On *Isopyrum biternatum*, Ann Arbor, Mich., Oct. 1893 (Harriet L. Merrow).

Hypophyllous, on dead blackened parts of the leaves. Hyphæ loosely tufted, subeffused, simple, clavate, continuous, 15–30 x 4μ, yellowish to the naked eye, nearly hyaline under the microscope. Conidia, 1–3-septate, hyaline, 15–60 x 4–6μ.

The shorter ones are cylindrical and mostly 1-septate, and resemble the conidia of *Ramularia Actææ*, but the longer ones are narrowed above and 3-(or more-)? septate.

Cercospora Briareus E. & E.

On leaves of *Acerates viridiflora*, near Elkton, Md., Aug. 1894 (Commons, No. 2,537).

Spots amphigenous, dull livid-purple, small, subelongated, 1–3 x 1 mm., subindefinite or partly limited by the veinlets. Hyphæ amphigenous, loosely tufted, spreading, subundulate, simple, equal, olive-brown, continuous or 1–3-septate, obtuse, 35–45 x 5–6μ. Conidia slender, 40–80 x 3½–4½μ, 6–8-septate, nearly straight, slightly brownish.

The spots, especially on the under side of the leaf are not perceptible; the hyphæ spreading over green areas of the leaf enclosed by the veinlets.

Heterosporium caulicolum E. & E.

On dead stems of *Rumex occidentalis*, North Park, Colo., July, 1894 (Prof. C. S. Crandall, No. 72).

Tufts effused. Hyphæ cespitose, stout, olive-brown (under the microscope), septate, torulose, subgeniculate above, 80–110 x 4–5μ. Conidia elliptical or oblong, pale yellowish-brown, 1–3-septate, 12–26 (mostly about 15) x 7–10μ, minutely echinulate-roughened. Appears like a coarse, black pubescence on the stems.

Heterosporium sphæriæforme E. & E.

On dead stems of *Eriogonum*, Fort Collins, Colo. (C. F. Baker, No. 270).

Hyphæ as in *H. caulicolum* E. & E. but not as rigid and collected in dense, scattered, olivaceous, sphæriæform, tufts ⅓–½ mm. diam., resembling a *Puccinia* or *Sphæria*. Conidia elliptical or oblong, 1–4- (mostly 1–2-) septate, 12–30 x 8–12μ, minutely echinulate-roughened, pale yellow-brown.

Heterosporium Eucalypti E. & E.

On dead leaves of *Eucalyptus*, California, Nov. 1893 (A. J. McClatchie, No. 542).

Hypophyllous, forming small (1–2 mm.), olive-black, orbicular patches scattered over the lower side of the leaf. Hyphæ subfasciculate-effused, pale yellowish-brown, continuous or sparingly septate, 70–80 x 4–5μ, geniculate-subundulate, slightly swollen at the tips. Conidia oblong-elliptical, 1–2-septate, pale yellowish, echinulate, 15–27 x 10–12μ.

Heterosporium cladosporioides E. & E.

On brown paper exposed by the roadside, Ann Arbor, Mich., May, 1894 (L. N. Johnson, No. 1,599).

Maculiform. Hyphæ erect, subfasciculate, brown, 90–110 x 4–5μ, septate, subundulate or subnodulose above. Conidia terminal, hyaline and continuous at first, then pale brown and minutely echinulate, 1–2-septate, 10–16 x 5–7μ not constricted.

The hyphæ form small black scattered patches about 2 mm. diam.

Heterosporium Trillii E. & E.

On leaves (partly dead) of *Trillium ovatum*, Latah Co., Idaho, July, 1893 (C. V. Piper, No. 128).

Spots at first suborbicular, gray with a whitish margin, soon confluent, overrunning and killing the leaves, which then become rusty brown. Hyphæ fasciculate, short, 30–50 x 5–6μ, variously toothed and shouldered above and more or less crooked, sparingly septate. Conidia oblong-cylindrical, 12–30 x 5–8μ, 1–3-septate, minutely echinulate, yellow-brown.

Macrosporium hybridum E. & E.

On bark of decaying *Sambucus glauca*, Pullman, Wash., Oct. 1893 (C. V. Piper, No. 151).

Forming black, subelongated patches or irregularly scattered. Hyphæ cespitose, olive-brown, coarse, 100–110 x 6–7μ, geniculate and subtorulose above, finally closely septate. Conidia variable; at first oblong-elliptical and mostly uniseptate, 8–15 x 5–7μ, pale yellowish-brown, then oblong, 2–3-septate and constricted, granular, 12–25 x 8–12μ. Other conidia are globose, 12–15μ, sarcinuliform, with two septa crossing each other at right angles, others again broad-clavate, 5–9-septate and muriform, 50–70 x 12–15μ.

The members of this genus are so variable that we have ventured to describe only forms with marked and recognizable characters.

Macrosporium iridicolum E. & E.

On leaves of *Iris Missouriensis*, Moscow, Idaho, May, 1894 (Prof. L. F. Henderson, No. 2,640).

Hyphæ short, tufted, obovate-oblong, continuous, 12–15 x 5–6μ, pale yellowish. Conidia clavate, 5–10-septate and muriform, 40–120 x 20–25μ, including the stout, cylindrical, persistent stipe. It is possible that what we have taken for hyphæ are tufts of young conidia; if so, the conidia are sessile. This is quite distinct from *Macrosporium Iridis* C. & E.

The tufts are at first scattered and distinct but finally confluent, forming pulverulent black patches consisting entirely of the free conidia.

Macrosporium Pelargonii E. & E.

On leaves of *Pelargonium* (cult.), Pasadena, Cala., Feb. 1894 (Prof. A. J. McClatchie).

Spots orbicular, 1–3 mm. diam., greenish at first, then rusty brown, with a narrow, raised margin causing them to appear discoid. Hyphæ amphigenous but more abundant above, effused or sparingly fasciculate, yellow-brown, erect, 2–3-septate, swollen at the tips, 25–30 x 5–6μ, bearing the terminal, obovate, or subquadrate, 3-septate, and muriform, 20–30 x 18–22μ conidia, which are mostly constricted at the middle septum and have no pedicel.

Macrosporium tabacinum E. & E.

On leaves of tobacco, North Carolina, Oct. 1891 (Prof. Gerald McCarthy), Missouri (Miss Clendinin).

Spots amphigenous, numerous, small, irregular or suborbicular, definite, thin, white, with a narrow, raised margin, 1–3 mm. diam. Hyphæ amphigenous, fasciculate, tufts effused, septate, geniculate above, ferruginous-brown, 30–50 x 3–4μ, crooked and spreading. Conidia obovate-clavate, stipitate, 3–9-septate and muriformly divided, 50–90 x 10–15μ. The smaller conidia are often without any stipe, while the larger ones have a persistent stipe from 8–25μ long.

This is closely allied to *M. caudatum* C. & E. It is called by the planters "white speck," and with *Phyllosticta tabaci* Pass. is very injurious to the plants.

Macrosporium olivaceum E. & E.

Parasitic on *Sphæropsis Asiminæ* E. & E., on dead limbs of *Asimina triloba*, Nuttallburg, West Va., March, 1894 (L. W. Nuttall, No. 388).

Forms a light olive, velutinous coat over the pustules of the

Sphæropsis. Hyphæ tufted, yellowish-brown (under the microscope), septate, erect, nearly straight or subundulate, 80–100 x 4–5μ. Conidia obovate or obpiriform, 3–5-septate and muriform, brown, 24–38 x 15–20μ, terminal, sessile. Conidia also occur subcubical or subglobose, 15–20μ diam. with 2-septa crossing each other at right angles.

Sporodesmium fructigenum E. & E.

On decaying apples, Las Cruces, New Mexico, Oct. 1893 (E. W. Wooton).

Appears like a thin, dark colored, velvety coating, appearing first around the stem end but finally spreading over the greater part of the apple Conidia subglobose or elliptical, stipitate, yellowish and uniseptate at first, finally nearly opake and muriform, 12–26μ in the longer diameter.

The conidia have a berry-like structure like that of *S. Rauii* E. & H. or *S. moriforme* Pk. The pedicels, which are 12–15 x 3μ are deciduous.

Sporodesmium subcupulatum E. & E.

On dead *Sambucus melanocarpa*, Cameron Pass, Colorado, July, 1894 (C. F. Baker, No. 236, partly).

At first tuberculiform, minute, $\frac{1}{3}$–$\frac{1}{2}$ mm. diam., erumpent and surrounded by the ruptured epidermis, becoming concave and often oblong 1–2 mm. long, $\frac{1}{2}$–$\frac{3}{4}$ mm. wide, slaty black; conidia olivaceous, muriform, subglobose, 10–15μ diam., or subelliptical or clavate-oblong, 20–30 x 10–12μ, sessile or with a short, thick pedicel. In the concave stage the acervuli and conidia are paler.

Sporodesmium tuberculiforme E. & E., n. sp.

On dead stems of *Sambucus racemosa*, near Rabbit Ear Pass, N. W. Colo., alt. 10,000 ft., July, 1894 (Prof. C. S. Crandall, No. 15).

Sporodochia tuberculiform, black, inside and out, about 1 mm. diam., flattened above. Conidia irregular in shape and variable in size, subcubical, subglobose, subelliptical, consisting of 2–20 subglobose cells variously conglomerated so as to form the conidia 8–20μ diam.

The tubercular mass consists almost entirely of the compacted conidia which are more perfectly developed in the superficial layer.

Podosporiella E. & E., n. gen. of *Phæostilbeæ Phragmosporæ*.

Stroma cellular, soft, not carbonaceous, short-cylindrical. Hyphæ short, simple, arising from all parts of the stroma. Conidia terminal, oblong or cylindrical, brown, 2- or more-septate.

Differs from *Podosporium* in its simple, cellular stroma (stipe).

Podosporiella humilis E. & E.

On leaves of *Garrya Veitchii*, Echo Mt., Cala., July, 1894 (Prof. A. J. McClatchie, No. 736).

Spots orbicular, brown, with a definite, dark margin 2–4 mm. diam. Stromata hypophyllous, scattered on the spots, black, short-cylindrical, or conic-cylindrical, about 1 mm. high and ½ mm. thick, of membranaceo-cellular structure. Hyphæ spreading on all sides from the stroma, pale brown, simple, continuous, 15–20 x 4–5μ, bearing the terminal, solitary, oblong-cylindrical, pale-brown, uniseptate at first, then 2–4-septate, 15–27 x 6–7μ conidia.

Illosporium cæspitosum E. & E.

On rotten wood, Nuttallburg, West Va., Dec. 1893 (L. W. Nuttall, No. 231).

Sporodochia globose, 100–110μ diam., cespitose, forming tufts about 1 mm. diam. Hyphæ 6–8μ thick, branched, the branches curved or tortuous. Conidia globose or ovate 6–12μ diam.

Differs from *I. coccinellum* Cke. in its color, and larger, cespitose sporodochia.

Illosporium album E. & E.

On cypress bark, Louisiana (Langlois, No. 284).

Sporodochia gregarious, milk-white, ovate, 140–160 x 100–110μ. Hyphæ imperfectly defined, free and mostly curved above, united below into a coarsely cellular, mass. Conidia peripherical, subglobose, 8–10μ diam.

Differs from *I. pallidum* Cooke, in its smaller sporodochia, imperfectly defined hyphæ, and milk-white color.

Trichægum nodulosum E. & E.

On dead leaves of *Carex Fraseri*, Nuttallburg, West Va., Feb. 1894 (L. W. Nuttall, No. 333).

Erumpent, tufted, becoming subeffused, black, tufts gregarious forming subvelutinous patches 2–4 mm. across, or when standing singly, the hyphæ and conidia forming a compact mass, ½–1 mm. diam., and resembling somewhat the sorus of a *Puccinia*. Hyphæ simple, sparingly fasciculate, brown, septate, often swollen at the

septa, about 4μ thick and 200–300μ long. Conidia near the base of the hyphæ, at first elliptical, yellowish-hyaline, uniseptate 8–10 x 6–7μ, soon becoming 4–6-septate, muriform and opake, 10–25μ diam., subglobose, obovate, or elliptical.

Pilacre gracilipes E. & E.

On rotten wood, Nuttallburg, West Va., Dec. 1893 (L. W. Nuttall, No. 274).

Scattered, stem slender, white-pruinose, 3 mm. long, $\frac{1}{4}$–$\frac{1}{3}$ mm. thick. Head subhemispherical, olivaceous, about 1 mm. diam. Fertile hyphæ hyaline, dichotomously branched, 2–2$\frac{1}{2}\mu$ thick, bearing the conidia laterally. Conidia globose or subglobose, yellow-brown under the microscope, 4–5$\frac{1}{2}\mu$ diam.

Smaller and of a more slender growth than *P. Petersii* B. & C.

Tubercularia hamata E. & E.

On dead limbs of *Celtis occidentalis*, Nuttallburg, West Va., Feb. 1894 (L. W. Nuttall, No. 313).

Depressed-hemispherical, umbonate, soon becoming black, $\frac{1}{2}$–1$\frac{1}{2}$ mm. diam. Conidia oblong, slightly curved, hyaline, 5–8 x 1$\frac{1}{2}$–2μ, on slender, simple sporophores 30–40μ long, incurved or involute at the tips.

Hymenula cerealis E. & E.

On wheat straw, Nuttallburg, West Va., May, 1894 (L. W. Nuttall, No. 495).

Sporodochia gelatinous, orbicular, yellowish-amber color, becoming darker, at first subpulvinate, becoming depressed or flattened, $\frac{1}{2}$–$\frac{3}{4}$ mm. diam. Basidia slender, 25–30 x 1$\frac{1}{2}\mu$, simple or oftener branched, the branches erect. Conidia hyaline, oblong, minute, 3–4 x 1–1$\frac{1}{2}\mu$.

Microcera erumpens E. & E.

On dead limbs of *Tsuga Canadensis*, Nuttallburg, West Va., Feb. 1894 (L. W. Nuttall, No. 371).

Sporodochia depressed-globose, $\frac{1}{2}$ mm. diam., at first covered by the epidermis, soon exposed and bare, orange-red, at length disappearing and leaving cup-shaped cavities in the bark. Conidia falcate, nucleate and finally 3- or more-septate, 75–83 x 3–4μ, hyaline, borne on short (20–35μ) sporophores which are more or less branched above.

Differs from *M. coccophila* Desm. in the shape of the sporodochia and their subcuticular origin.

NOTES ON THE MAMMALS OF MONROE AND PIKE COUNTIES, PENNSYLVANIA.

BY SAMUEL N. RHOADS.

We have much to learn respecting the mammal fauna of the most densely populated and longest settled districts of the United States. To no region is this remark more applicable than the States of Pennsylvania and New Jersey. In the American Naturalist for January, 1893, Mr. Witmer Stone and myself recorded the capture of two new species belonging to genera hitherto unknown to the fauna of New Jersey, and later Mr. Stone described a Cave Rat, belonging to the genus *Neotoma*, from South Mountain, Pennsylvania, which is the first notice we have of the present existence of that genus in the State.

A recent visit to the wilder portions of northeastern Pennsylvania in the interests of natural history enables me to contribute the following notes to our knowledge of the mammals of the region. One week in September was spent at the farm of Mr. Chas. Yaggie, (1,000 ft. alt.), on the west bank of Big Bushkill Creek, in Monroe County, at a point seven miles east of Cresco, where the creek enters the southwestern corner of Pike County. Another week in October was occupied in the vicinity of Dingman's Ferry, Pike County, and for three days I was located at Porter's Lake (1,200 feet alt.), in the same county. Systematic trapping of the smaller mammalia was kept up during my stay at all these localities. On the results of this work and of my inquiries among the woodsmen and older residents of the places visited, the following notes are based. To Dr. Philip Fulmer, of Dingman's Ferry, and Mr. Harvey Eilenberger, of East Stroudsburg, the latter a veteran deer-hunter, whom I had the pleasure of meeting at Porter's Lake, I am chiefly indebted for outside information. The reliability of the statements of these gentlemen on such subjects is unquestionable.

The area covered by my investigations is mainly included in the eastern extension of the Pocono plateau, the average elevation of which, at the points visited, is from 1,000 to 1,500 feet. The greatest

elevation attained was the summit of High Knob, 2,010 feet above the sea; the lowest was at Dingman's Ferry (350 feet), on the Delaware River. The greater part of Porter and Delaware townships have not only been long denuded of their original forests of oak, pine, and hemlock, but have of late years been frequently swept with fire. This fact, combined with the stony character of the soil, gives the country a desolate appearance, and has, undoubtedly, brought about marked changes in the character of its fauna and flora since the advent of the white man. At the present time it is difficult to find, for hundreds of square miles so much as an acre of mature evergreen timber that does not show the ravages of fire and axe. In some places the presence of a watercourse or swamp has retarded these influences and we find a strip of oaks, chestnuts, and pines of comparatively recent growth to relieve the monotony of vast stretches of scrub oak and bushes. Both fauna and flora combine in an interesting manner the features of the Alleghanian, Canadian, and Carolinian life-regions.

The following is a list, with annotations, of those species observed by the writer or reported on by the gentlemen above mentioned:—

1. **Didelphys marsupialis virginiana** (Kerr). Virginian Opossum.

The rare occurrence of this Carolinian species in the fauna of the Pocono plateau of Pike and Monroe counties, even up to an elevation of 1,500 feet is a fact of interest. Specimens have been taken at Porter's Lake. At Dingman's Ferry they are less rare.

2. **Cariacus virginianus** (Bodd.). Virginia Deer.

A buck was killed at Schauff's Pond the first week in October. In spite of the immense range and the sparsely populated condition of the country, the deer are becoming very scarce. Mr. Eilenberger attributes this to the continual destruction of deer by the natives throughout the year, and to the forest fires, which often overtake the newly-born fawns, and in many ways so worry the older deer that they leave the county.

Last year the county newspaper at Milford published its annual authenticated list of deer killed in Pike County during the game season of 1893. They numbered 140.

Mr. Eilenberger thinks a close season of three years and a law to prevent the export of deer for sale would quickly and permanently restock the Pocono wilderness with this noble animal.

3. Cervus americanus (Erxl.). Wapiti.

The "Elk" was probably never as numerous in this region as in the central Alleghany Mountains, those individuals taken in former days being considered by the natives as stragglers from the main body. The last capture in Pike County was probably not later than 1840 or 1845.

Remains of the Bison and Caribou found in Hartman's Cave near Stroudsburg, have been described and figured by Dr. Jos. Leidy in the Penna. Geological Report for 1887.

It is very improbable that either species co-existed in this part of Pennsylvania, with Man.

4. Sciurus carolinensis pennsylvanicus (Ord). Northern Gray Squirrel.

Very few were seen. They are said to be abundant in certain localities of exceptional food supply. The hunters frequently shoot the melanistic form, which is the original variety on which George Ord based his specific name for the "Small Black Squirrel" of Guthrie's Geography, in 1815.

5. Sciurus hudsonicus (Erxleben). Red Squirrel, Chickaree.

Abundant as the sparsely wooded character of the country will permit.

6. Sciuropterus volans (L.) Jordan[1]. Flying Squirrel.

No specimens of this animal were seen. They are reported as numerous, and more frequently found in nests built among the branches of a pine than in hollow trees. It is very probable that this species on the Pocono mountain is nearer to the typical Virginian form than to *sabrinus* of the Canadian fauna, as in the case of *Tamias striatus* and its subspecies *T. s. lysteri*.

7. Tamias striatus (L.). Chipmunk.

In the more mountainous districts the chipmunk is by far the most ubiquitous mammal of its class, the more favorable situations being so thickly tenanted by them as to suggest the Spermophile colonies of the West. They showed no disposition to hibernate up to the last day of my stay (October 14th), though the nights were often frosty.

Pocono chipmunks are referable to typical *striatus* rather than to the Canadian variety, *T. s. lysteri*, which is found in the northwestern parts of Pennsylvania.

[1] See "Manual of the Vertebrates," 1888, p. 324 (foot-note).

8. Castor fiber canadensis (Kuhl). American Beaver.

The older residents concur in the opinion that the beaver was exterminated nearly fifty years ago in northwestern Pennsylvania. Their dams and meadows are still pointed out in numerous places along the Bushkill and Dingman's creeks.

9. Mus rattus L. Black Rat.

This least offensive member of the Old World Muridæ remains in undisputed possession of the barns and outhouses of the more remote districts, but along the Delaware valley it has given place to the following:—

10. Mus decumanus Pallas. Norway Rat.

As in other places where this pest has foothold, the supply far exceeds the demand.

11. Mus musculus L. House Mouse.

Well represented.

12. Neotoma magister Baird. Alleghany Cave Rat.

Remains of this animal, both fossilized and those apparently quite recent, were taken, in 1880, from Hartman's Cave in Monroe County, by Mr. T. D. Paret, of Stroudsburg.

I have as yet been unable to determine whether this interesting animal is still living in that county or in Pike county. The evidence from every source is negative, and this after the most diligent inquiry.

I personally explored several ledges, notably those of High Knob and the cliffs along the Delaware south of Milford, without finding a trace of their existence. It is not impossible, however, that the recent habitat of this species may be traced, by isolated localities along the Blue Ridge from South Mountain to the Hudson River Highlands. Dr. C. H. Merriam, in a recent communication, states that he believes the specimens of *Neotoma*, taken many years ago on the Hudson near Rockland, New York, to be of this species.

13. Peromyscus americanus (Kerr) Thomas.[2] White-footed Mouse.

Numerous specimens of all ages, taken in three distinctly separated localities, strongly indicate a local variety of this susceptible species, which apparently forms a connecting link between typical Pennsyl-

[2] See Ann. & Mag. N. H., Nov. 1894, p. 364.

vania *americanus* and New England examples of *S. a. canadensis.* Their longer tails and lack of a distinct dorsal stripe indicate this.

The Pocono mice are of a more uniform and much duller brown on the upper parts than south Pennsylvania specimens, and in old individuals there is no trace of the dusky dorsal stripe which is so pronounced in specimens from New Jersey and New England. Specimens from Pike County match one in the collection from Lorne Park, Ontario, and three from Clinton County, Pennsylvania.

14. Fiber zibethicus L. Muskrat.

Not abundant.

15. Arvicola pennsylvanicus (Ord). Common Meadow Mouse.

Abundant, and constant to its typical characters in all situations.

16. Arvicola pinetorum (LeConte). Pine Mouse.

A specimen taken at Yaggie's farm, and another at Porter's Lake attest the semiboreal range of this southern species.

17. Evotomys gapperi (Vigors). Red-backed Mouse.

A rather rare species. Four captures were made at Yaggie's in the more heavily timbered swamps. This animal does not appear to confine its operations to runways or underground as does the true *Arvicola*, but forages about like *Sitomys* in more open situations at the surface.

I took none at Dingman's Ferry, and am of the opinion they are not found much below an altitude of 1,000 feet in Pike County.

18. Synaptomys cooperi Baird. Cooper's Lemming Mouse.

One of these highly interesting rodents was captured in a meadow bordering the Bushkill, on Yaggie's farm. It was taken in a "cyclone trap," set in the runways of *Arvicola pennsylvanicus*, near the edge of a dry swamp. A specimen of the latter species was subsequently taken in the same spot. This is the first authenticated record for Pennsylvania of Cooper's mouse, though it is not improbable that the type was taken within fifty miles of this place, either on that or the New Jersey side of the Delaware.

This, together with recent captures in New England and eastern Canada, may now be considered sufficient to fix the type habitat of Cooper's mouse east of the Alleghany Mountains, rather than west of them as was once considered possible, owing to the total lack of recorded eastern specimens.

In a recent paper, Mr. Outram Bangs[3] has endeavored to show that *Synaptomys stonei* described by me from southern New Jersey is a synonym of *S. cooperi.*

A comparison of the three specimens of *stonei*, taken at May's Landing, with individuals taken in New England by Mr. Bangs at the same season of year, show no cranial differences of value. In *stonei*, however, there is a decided difference in the darker colors of the pelage as contrasted with the New England skins and with the skin from Pike County. This is manifested in the blackish-brown of the back and upper head, the sooty feet and tail, and the lead-colored lower parts of *stonei*, contrasted with the gray-brown upper parts, light-brown feet and tail, and hoary under parts of the more northern specimens which, as I had previously inferred, were in all probability taken nearest the type locality of *cooperi.* In these particulars there is a striking correlation with the color differences pointed out by Mr. Stone for his subspecies of *Evotomys gapperi*,[4] taken in the same bog which furnished the types of *S. stonei.* On these grounds, taking for granted that *S. cooperi* is typified by the form found east of the Alleghany Mountains, I would now refer to the southern New Jersey lemming mouse as *Synaptomys cooperi stonei.*

My original description of *stonei* was drawn up from a comparison with two specimens from Ohio, and, so far as it went, was apparently a sufficient reason for specific separation. It is not impossible that a full series of western specimens will yet indicate the propriety of further division.

19. Zapus hudsonius (Zimm.). Meadow Jumping Mouse.

20. Zapus insignis Miller. Woodland Jumping Mouse.

I was surprised to neither see nor capture any of these mice during my stay. They had evidently just gone into their winter trance, and the loveliest Indian summer weather failed to rouse them. This is an interesting fact, as only a few days before my stay they had been seen by "mine host," and one of the woodland species (which I was surprised to find he recognized as different from the meadow jumping mouse) was killed by him as it swam across the Bushkill. Mr. Shryock took a specimen of *insignis* on Pocono Mountain in 1893.

[3] Proc. Biol. Soc., Washn., 1894.
[4] Amer. Naturalist, Jan. 1893.

21. Erethizon dorsatus (L.). Canada Porcupine.

This is another boreal species whose presence on the Pocono plateau has always been rather precarious, and, with the vanishing forest areas, it has become so rare that it is believed by many hunters to be exterminated. The most active of these gentlemen have not seen any "for several years."

22. Lepus americanus Erxl. Varying Hare.

Not uncommon in the higher mountain swamps.

23. Lepus sylvaticus Bachm. Rabbit.

Normally abundant in all situations.

24. Felis concolor L. Puma, Panther.

A panther, I am assured by Mr. Eilenberger, has not been killed in Pike County for thirty years, all reports to the contrary notwithstanding. From conversation with several hunters it appears that the name "catamount" in this region is applied to any animal, not distinctly seen, which is larger than a wild-cat and has a longer tail, but is smaller than a panther! When a very large or abnormally colored wild-cat is trapped, it also may receive this higher sounding title. The yell of a wild-cat is a fruitful source of "catamount" stories, the horror of such an experience making the use of the commoner name a totally inadequate expression.

25. Lynx canadensis (Desm.). Canada Lynx.

Many residents near Porter's Lake assured me that this species is occasionally trapped in that vicinity. The occurrence of the lynx in these parts is not attested by any reliable records known to me.

26. Lynx rufus (Guld.). Wild-cat.

Many pelts of this destructive animal are annually taken in both counties.

27. Canis lupus nubilus (Say). American Gray Wolf.

I can get no information as to the date of the disappearance of the timber wolf from this part of the State. Conservative residents set it as nearly forty years ago, but it is probable they existed to a much later date.

28. Vulpes vulpes pensylvanicus (Bodd.). American Red Fox.

An abundant resident.

29. Urocyon cinereo-argenteus (Müll.). Gray Fox.

Occasionally taken by hunters.

30. Ursus americanus Pallas. American Black Bear.

Rarely killed, but evidences of their existence are frequently seen in the mountains. They hibernate in severe winters.

31. Putorius erminea (L.). Weasel, Ermine.

Specimens of this weasel were examined in the collection of Mr. Justin Nilis, of Edgemere, Pike Co. Two of them were in the white pelage.

32. Lutreola vison Schreber. Mink.

Abundant.

33. Mustela americana Turton. Pine Marten.

I could hear of no specimens of this former resident having been captured for many years. Of the Pekan, *M. pennanti*, none of the inhabitants had any knowledge.

34. Lutra hudsonica Lacèp. American Otter.

This fisherman is sufficiently numerous to be a nuisance to the owners of game preserves along the Bushkill. I found one in a trap on the banks of that stream near Yaggie's farm. They are frequently seen in Porter's Lake, and Mr. Van Vliet of that place states that they sometimes devour mussels in the same manner as the muskrat.

35. Mephitis mephitica (Shaw). Common Skunk.

Normally abundant. A visit was paid to the farm near Shawnee, in Monroe County, where these animals are being bred for their furs. Unfortunately no one was at home at the time, and I was unable to secure any data respecting the success of this experiment. A neighbor stated that the venture was not profitable and on the decline.

36. Procyon lotor (L.). Raccoon.

Stated to be very abundant.

37. †Sorex forsteri Rich. Forster's Shrew.

I refer a small, brown shrew, taken in *Arvicola* runways, in a meadow near woodland, to this species, with some doubt. In its small size and the character of its coloration it agrees well with

Richardson's description. It was taken on the banks of the Bushkill where it crosses the southwestern corner of Pike County. It is similar to several specimens taken in Maine and central Quebec.[5]

38. ?Sorex ———.

Four specimens of a rather large, bluish-gray shrew answering Baird's description of *S. forsteri*, one taken at Yaggie's and three on Dingman's Creek, are very distinct from the preceding species in size, color, and habits. The *S. forsteri* of Baird I am convinced is not the same as the *S. forsteri* of Richardson. It is very probable that the four specimens in question are identical with the animal described by Baird as *forsteri*. What name, among the numerous existing ones, should be given this bluish-gray shrew with light colored feet and chin and brownish neck, forearm, chest, and vent, and bicolored tail, I am at a loss to know.

39. Sorex (Neosorex) albibarbis (Cope). Eastern marsh Shrew.

It is with no small satisfaction that I announce the discovery of a member of this subgenus in Pennsylvania. One specimen was taken along the banks of a rocky stream flowing into the Big Bushkill, in Monroe County. It is the most southerly record for the subgenus, the previous record being from Warwick, Massachusetts. After going over the ground somewhat, it appears proper to endorse the verification of Mr. G. S. Miller, Jr., in the Proceedings of the Boston Society of Natural History, in giving this shrew the name applied to New England examples by Prof. Cope in 1863. Specimens from Lac Aux Sables, Quebec, and from Lincoln, Maine, agree better, in the brownish cast of lower parts, with Prof. Cope's diagnosis of *albibarbis*, as contrasted with the "ash-colored" belly of *S. palustris* given by Richardson in the Fauna Boreali Americana.

In the Pike County specimen, though identical in dentition and proportionate measurements with my Canadian specimens, the colors are much as in Richardson's diagnosis of *palustris*, showing that the brown belly character is inconstant in eastern specimens. It is probable, however, that the exceptions are in immature pelage. For a full discussion of these questions, see paper by Mr. G. S. Miller, Jr., in the Proceedings of the Boston Society of Natural History, Vol. XXVI.

[5] Mr. G. S. Miller, Jr., has since identified these shrews to be *S. personatus* G. St. Hilaire.

40. Blarina talpoides (Gapper). Mole Shrew.

Excessively abundant in all sorts of situations, from wettest lowlands to barren mountain tops.

Owing to its numbers and carnivorous appetite this shrew is a great nuisance to the mouse trapper.

41. Scalops aquaticus (L.). Common Mole.

Rare among the mountains.

42. Condylura cristata (L.). Star-Nosed Mole.

Mr. Chas. Yaggie caught a specimen on his farm.

43. Adelonycteris fuscus (Beauv.). Carolina Bat.

44. Atalapha borealis (Müll.). Red Bat.

45. Vespertilio gryphus Fr. Cuvier. Little Brown Bat.

Several bats were observed, most, if not all, of which, are probably referable to these species.

I could find no one acquainted with a large bat which would be referable to the Hoary Bat, *Atalapha cinerea*.

A STUDY OF THE SYSTEMATIC AND GEOGRAPHICAL DISTRIBUTION OF THE DECAPOD FAMILY ATYIDÆ Kingsley.

BY ARNOLD E. ORTMANN.

In the following paper I propose to give a revision of the family *Atyidæ* with especial reference to its geographical distribution. For a true representation of the geographical range of a group of animals it is necessary to examine the details of the distribution of all the known species, as well as to define the systematic limits of each. Every error in determining a species may be followed by great confusion difficult to solve by subsequent investigation. In revising the known genera and species it is necessary to state the relations and affinities to each other in order to get an idea of the peculiarities of the geographical distribution and to find out their cause.

The family *Atyidæ*, although a small one, comprises a considerable number of ill-defined species and genera, since most authors in creating such did not investigate their relations to those already known. In the typical genus *Atya* there are farther difficulties due to the change of characters undergone by one species in the different stages of life, which were wholly neglected by the majority of authors. I have, notwithstanding, succeeded in revising the family, pointing out the identity of certain species and genera, defining some more correctly, and stating the affinities so as to leave but a few species doubtful. I have determined a peculiar geographical distribution of the family agreeing well with its habits and morphological characters.

The family *Atyidæ* is a very characteristic one among the Decapod group of *Eucyphidea*. It shows on the one hand a number of primitive characters, on the other a very peculiar shape of the fingers of the chelæ. As I have stated in a former paper,[1] the *Atyidæ* are closely connected with the family *Acanthephyridæ*, which live at great depths in the sea and contain, without doubt, the most primitive *Eucyphidea*. The morphological differences between the two families are the following: 1. The mandible in the *Acanthephyridæ* is furnished with a palpus (synaphipod), in the *Atyidæ* it is wanting.

[1] Decapoden u. Schizopoden der Plankton-Expedition, 1893, p. 42.

2. The fingers of the chelæ in the *Acanthephyridæ* are normal in shape, in the *Atyidæ* they are provided with a peculiar pencil of hairs. I may add that the habits of the two families are wholly different, the *Acanthephyridæ* being true marine animals, especially abyssal, the *Atyidæ* being true fresh-water forms.

Among the *Atyidæ* Kingsley distinguished two subfamilies, *Atyinæ* and *Ephyrinæ*. Since, however, there are but a few genera in this family, a subdivision is needless. The genera form a continuous series, the transition being so gradual that it is difficult to define the limits of the two subfamilies. In the following synopsis of the genera the first three named, *Xiphocaris*, *Troglocaris*, and *Atyaëphyra* may be regarded as belonging to the subfamily *Ephyrinæ* as created by Kingsley, the others as belonging to the *Atyinæ*. Because the genus *Ephyra*, from which is derived the name *Ephyrinæ*, is a synonym, this subfamily must be renamed, and I propose to name it, if at all, *Xiphocarinæ*.

The presence of exopodites on the pereiopoda of the *Xiphocarinæ*, the shape of the carpal and propodal joints of the first two pairs of pereiopoda, and the shape of the rostrum constitute a very close resemblance to the *Acanthephyridæ*. *Atyaëphyra* makes a transition to the *Atyinæ*, bearing exopodites only on the first two pairs of pereiopoda, and having the carpal joints of these legs excavated at the distal extremity. This excavation is very characteristic in the true *Atyinæ*, but in *Caridina* the carpal joint only of the first pair of legs shows this peculiarity, that of the second pair being normal. *Atyoida* is intermediate between *Caridina* and *Atya* in the shape of the propodal joints of these legs. Within the limits of *Caridina* occurs a reduction of the form of the rostrum (being in the *Xiphocarinæ* long and serrated), which in most species of *Caridina* is longer or shorter and serrated, in a few very short and not serrated. In *Atyoida* and *Atya* the rostrum is usually short, but now and then it bears a few teeth on the inferior margin. Thus the series formed by *Xiphocaris*, *Atyaëphyra*, *Caridina*, *Atyoida*, and *Atya* is a continuous one, whilst the genus *Troglocaris* is closely allied to *Xiphocaris* differing only by the rudimentary condition of the eyes, due to its subterranean habits in cave-waters.

The genus *Atya* is the most extreme of the family. The adult males of the species of this genus attain a considerable size, and the third pereiopoda undergo with increase of age a change in shape,

the surface of the body and legs bearing a peculiar sculpture. The most extreme species, *Atya crassa*, may be separated from the others according to the sculpture of the body and placed in a separate subgenus, *Evatya*.

Fossil *Atyidæ* are not known, although A. Milne-Edwards[2] describes a *Caridina nitida* from the "marnes d'Aix-en-Provence" (upper eocene or lower oligocene). None of the arguments given by him prove that this fossil is a *Caridina*. The presence in a fresh-water deposit makes it probable that it belongs to *Atyidæ*, but for the same reason *Homelys minor* of Meyer,[3] from the fresh-water deposits of the upper miocene of Œningen, would belong to the same family.

ATYIDÆ Kingsley, 1879.

Kingsley, Proceed. Acad. Nat. Sci., Philadelphia, 1879, p. 414. Bate, Challenger Macrur., 1888, p. 691. Ortmann, Zoolog. Jahrb., V, 1890, p. 455.

Mandibles stout, crown broad, dilated, slightly divided, without a synaphipod. First four pairs of pereiopoda with epipodites. First two pairs of pereiopoda chelate, nearly equal, carpus of the second not annulated. Tips of fingers with pencils of hairs. Rostrum longer or shorter, serrated or not serrated.

a_1. Pereiopoda with exopodites [*Xiphocarinæ*].
- b_1. All the pereiopoda with exopodites. Carpal joints of the first two pairs of pereiopoda not excavated or but indistinctly so.
 - c_1. Eyes well developed XIPHOCARIS.
 - c_2. Eyes rudimentary TROGLOCARIS.
- b_2. Only the first two pairs of pereiopoda with exopodites. Carpal joints of the first and second pair of pereiopoda distally excavated ATYAËPHYRA.

a_2. Pereiopoda without exopodites [*Atyinæ*].
- b_1. Carpal joint of the second pereiopoda normal, not excavated. Rostrum mostly compressed and serrated . . . CARIDINA.
- b_2. Carpal joint of the second pereiopoda like that of the first distally excavated.
 - c_1. Movable finger shorter than the immovable part of hand, the latter distinctly divided in a palmar portion and an immovable finger ATYOIDA.
 - c_2 Both fingers alike in size, no palma developed . ATYA.

[2] Bull. Soc. Philomat., Paris (7), II, 1879, p. 77.
[3] Palæontographica, X, 3, 1862, p. 172, pl. 19, figs. 3-8.

XIPHOCARIS v. Martens, 1872.

Ephyra de Haan, Faun. Japon., Crust., Dec. 6, 1849, p. 185.[4] (Nomen præoccupatum.)
Xiphocaris v. Martens, Archiv f. Naturg., 38, 1, 1872, p. 139.
Miersia Kingsley, Proceed. Acad. Nat. Sci., Philadelphia, 1879, p. 416.
Xiphocaris Kingsley, Bull. Essex Instit., vol. 14, 1882, p. 127.
Paralya Miers, Annal. Mag. Nat. Hist. (5), IX, 1882, p. 194.
Xiphocaris Pocock, Annal. Mag. Nat. Hist. (6), III, 1889, p. 17.
Miersia Ortmann, Jenaische Denkschr., VIII, 1894, p. 8.

a_1. No supraocular spines. Rostrum longer or shorter, with an interrupted series of teeth on the upper margin, the basal series containing 9–18, the apical 3–6 teeth Lower margin of rostrum with numerous (16–40) teeth *X. elongata.*

SUBSPECIES (or varieties).

b_1. Rostrum longer than carapace . . . *X. elongata typica* (1).[5]
b_2. Rostrum shorter than carapace.
c_1. Rostrum longer than the scaphocerite.
. *X. elongata intermedia* (1).
c_2. Rostrum longer than the stalk of antennulæ.
. *X. elongata gladiator.*
c_3. Rostrum shorter than the stalk of antennulæ.
. *X. elongata brevirostris.*

a_2. Supraocular spines present. Rostrum about as long as the scaphocerites or somewhat longer. An uninterrupted series of 20–24 teeth on the upper, 2–4 teeth on the lower margin.
. *X. compressa* (3).

1. Xiphocaris elongata (Guérin), 1857.

Hippolyte elongata Guérin, Anim. Artic. in: Ramon de la Sagra, Hist. de l'île de Cuba, 1857, p. 54, pl. 2, fig. 16.
Oplophorus americanus Saussure, Mem. Soc. Phys. Hist. Nat. Genève, t. 14, 2, 1858, p. 472, pl. 4, fig. 31.
Xiphocaris elongata (Guér.) v. Martens, Arch. f. Naturg., 38, 1, 1872, p. 140.
Oplophorus elongata (Guér.) Kingsley, Bull. Essex Instit., X, 1878, p. 68.
Xiphocaris elongata (Guér.) Pocock, Ann. Mag. Nat. Hist. (6), III, 1889, p. 17 ff, pl. 2, figs. 5–8.
Xiphocaris gladiator, var. *intermedia*, *brevirostris* Pocock, ibid.
Oplophorus elongatus (Guér.) Sharp, Proceed. Acad. Nat. Sci., Philadelphia, 1893, p, 121.

Geographical distribution: Fresh-waters of the Antilles.—Cuba (Guérin, v. Martens); Hayti (Saussure); Dominica (Pocock); St. Domingo (Sharp).

2. Xiphocaris compressa (de Haan), 1849.

Ephyra compressa de Haan, Faun. Japon. Crust., Dec. 6, 1849, p. 186, pl. 46, fig. 7.
Atyephyra compressa (d. H.) v. Martens, Arch. f. Naturg., 34, 1, 1868, p. 51 ff, pl. 1, fig. 4.
Atyephyra compressa (d. H.) Miers, Ann. Mag. Nat. Hist. (5), IX, 1882, p. 193.

[4] Non *Ephyra* Roux, Memoir. Salicoques, 1831, p. 24, which is identical with *Acanthephyra* A. Milne-Edwards, and belongs to the *Acanthephyridæ*.
[5] I put in parentheses following each species, the number of specimens I have examined myself.

Miersia compressa (d. H.) Ortmann, Zoolog. Jahrb., V, 1890, p. 463.
Miersia compressa (d. H.) Ortmann, Jenaisch. Denkschr.. VIII, 1894, p. 8.

Geographical distribution: Fresh-water of Australasia.—Japan (de Haan); Yokohama (v. Martens), Tokio (Miers, Ortmann); Island of Adenare, near Flores (v. Martens); Queensland: Burnett (Ortmann).

TROGLOCARIS Dormitzer, 1853. Dormitzer, Lotos, III, 1853, p. 85.

Only one species known, distinguished from *Xiphocaris* by the rudimentary condition of the eyes. Supraocular spines present.

1. Troglocaris schmidti Dormitzer, 1853.[6]

Dormitzer, ibid., p. 85 ff, pl. 3.

Geographical distribution: In the waters of the caves of Carniola. Caves of Kumpole and Gurk (Dormitzer).

ATYAËPHYRA Brito-Capello, 1866.

Atyaëphyra Brito-Capello, Descr. Esp. nov. Crust. Arachn., Portugal, Lisboa, 1866, p. 5.
Hemicaridina Ortmann, Zoolog. Jahrb., V, 1890, p. 464.

Only one species known.

1. Atyaëphyra desmarestii (Millet) 1832 (16).

Hippolyte desmarestii Millet, Annal. Sci. Nat., t. 25, 1832, p. 461, pl. 10 B.
Hippolyte desmarestii Millet, Milne-Edwards, Hist. Nat. Crust., II, 1837, p. 376.
Caridina desmarestii (Mill.) Joly, Annal. Sci. Nat. (2), Zool., t. 19, 1843, p. 34 ff, pl. 3.
Caridina desmarestii (Mill.) Heller, Crust. südl. Europ., 1863, p. 238, pl. 8, fig. 3.
Atyaëphyra rosiana Brito-Capello, Descr. esp. nov. Crust. Arachn., Portugal, Lisboa, 1866, p. 6, pl. 1, fig. 1.
Hemicaridina desmarestii (Mill.) Ortmann, Zoolog. Jahrb., V, 1890, p. 464.

Geographical distribution: Fresh-water of southern Europe.—Portugal: Coimbra (Brito-Capello); southern and western France (Millet, Joly); Corsica, Sicily, Dalmatia (Heller).

CARIDINA Milne-Edwards, 1837.

Caridina Milne-Edwards, Hist. Nat. Crust., II, 1837, p, 362.
Caradina Kingsley, Proceed. Acad. Nat. Sci., Philadelphia, 1879, p. 415.

a_1. Rostrum longer or shorter, serrated. Anterior margin of carapace with an antennal-spine.

b_1. Upper margin of rostrum not serrated. Carpal joint of the first pereiopoda but slightly longer than broad *C. typus* (2).
. *C. americana.*[7]

[6] There is no doubt that the *Palæmon anophthalmus* Kollar, Sitz. Ber. Akad. Wiss., Wien, I, 1848, p. 137, from the caves of Kompoljska and Portiskavez in Carniola is the same species as *Troglocaris schmidti*. As there is no published description by Kollar, the name *anophthalmus* cannot be employed.

[7] *C. americana* is a somewhat doubtful species, but certainly it is closely allied to *C. typus*.

b_2. Upper margin of rostrum serrated.
c_1. Carpal joint of the second pereiopoda shorter than the hand, carpal joint of the first pereiopoda short. Rostrum about as long as the antennal scale. *C. brevicarpalis* (1).
c_2. Carpal joint of the second pereiopoda longer than the hand.
d_1. Rostrum horizontally projecting or slightly deflexed, shorter than the antennal scale.
e_1. Carpal joint of the first pereiopoda short, not more than $1\frac{1}{2}$ as long as broad.
f_1. Lower margin of rostrum serrated.
g_1. Upper margin of rostrum with about 13–20 teeth, rostrum mostly longer than the first joint of the antennulæ.
h_1. Eggs small and numerous. Fingers of the second pereiopoda twice as long as the palm.
i_1. Carpal joint of the first pereiopoda distinctly longer than broad *C. weberi.*
i_2. Carpal joint of the first pereiopoda nearly as broad as it is long *C. japonica.*
h_2. Eggs greater and not numerous. Fingers of the second pereiopoda but slightly longer than the palm. *C. pareparensis.*
g_2. Upper margin of rostrum with 3–5 teeth; rostrum as long or a little longer than the first joint of the antennulæ. *C. timorensis.*
g_3. Upper margin of rostrum with 7–12 teeth; rostrum shorter than the first joint of the antennulæ. *C. parvirostris.*
f_2. Lower margin of rostrum not serrated. . . . *C. richtersi.*
e_2. Carpal joint of the first pereiopoda longer, at least twice as long as broad.
f_1. Spine at the base of the antennulæ shorter than the first joint.
g_1. Dactylus of the fifth pereiopoda nearly half as long as the propodus. *C. lævis.*
g_2. Dactylus of the fifth pereiopoda very short, $\frac{2}{5}$–$\frac{1}{7}$ of the propodus.
h_1. Rostrum shorter than the stalk of the antennulæ, upper margin with 20–30 teeth, lower with 5–14. *C. multidentata.*
h_2. Rostrum about as long as the stalk of the antennulæ.
i_1. Teeth of the upper margin of rostrum 10–15, not continued to the tip of rostrum, on the tip 1–2 teeth, on the lower margin 7–12. *C. africana* (many).
i_2. Teeth of the upper margin of rostrum 20–25, in a continuous series to the tip. *C. fossarum.*

f_2. Spine at the base of the antennulæ longer than the first joint *C. serratirostris.*

d_2. Rostrum slightly bent upward, longer than the antennal scale. Upper margin partially destitute of teeth.

e_1. The proximal teeth on the upper margin of rostrum crowded, numerous.

f_1. Carpal joint of the first pereiopoda a little shorter than the hand.

g_1. Carpal joint of the first pereiopoda 2–2½ as long as broad *C. wycki* (many).

g_2. Carpal joint of the first pereiopoda only 1½ as long as broad *C. nilotica* (1).

f_2. Carpal joint of the first pereiopoda very much shorter than the hand *C. grandirostris.*

e_2. The proximal teeth on the upper margin of rostrum remote, not numerous *C. gracilirostris.*

a_2. Rostrum very short, not serrated. Anterior margin of the carapace without an antennal spine.

b_1. Fingers of the first pereiopoda about as long as the palm. *C. singhalensis* (many).

b_2. Fingers of the first pereiopoda much shorter than the palm. *C. brevirostris.*

1. Caridina typus Milne-Edwards, 1837.[8]

Caridina typus Milne-Edwards, Hist. Nat. Crust., II, 1837, p. 363, pl. 25 bis, figs. 4, 5.
C. exilirostris Stimpson, Proceed. Acad. Nat. Sci., Philadelphia, 1860, p. 29.
C. siamensis Giebel, Zeitschr. f. d. ges. Naturw., 21, 1863, p. 329.
C. typus M. E., Miers, Philosoph. Trans. London, 168, 1879, p. 492. Richters, Beitr. Meeresfaun. Maurit. Seychell. Decap., 1880, p. 162, pl. 17, fig. 23.
C. typus M. E., de Man, in Weber, Zoolog. Ergebn. Reis. Niederl. Ost-Indien, II, 1892, p. 367, pl. 21, fig. 22.
C. typus M. E., de Man, Not. Leyd. Mus., 15, 1893, p. 300.
C. typus M. E., Sharp, Proceed. Acad. Nat. Sci., Philadelphia, 1893, p. 111.
C. typus M. E., Ortmann, Jenaische Denkschr., VIII, 1894, p. 8.

Geographical distribution: Fresh-water of the Islands of the Indian Ocean and of Indo-Malaysia.—Mauritius (Richters, Sharp); Rodriguez (Miers); Seychelles (Richters); Siam (Giebel); Flores, Timor, Saleyer, Celebes (de Man); Amboina (Ortmann); Loo-Choo (Stimpson).

2. Caridina americana Guérin, 1857.

Guérin, Anim. Artic. in Ramon de la Sagra, Hist. de l'île de Cuba, 1857, p. 52, pl. 2, fig. 13.
v. Martens, Arch. f. Naturg., 38, 1, 1872, p. 135.
Pocock, Ann. Mag. Nat. Hist. (6), III, 1889, p. 16, pl. 2, fig. 4.

Geographical distribution: Cuba (Guérin, v. Martens); Dominica (Pocock).

[8] *Caridina typus* Bate, Challenger Macr. 1888, p. 704, pl. 119, fig. 3, from San Jago, Cape Verde Isl. is probably a different species.

3. Caridina brevicarpalis de Man, 1892.

De Man, in Weber, Zool. Erg., etc., II, 1892, p. 397, pl. 24, fig. 30.
Ortmann, Jenaische Denkschr., VIII, 1894, p. 9.

Geographical distribution: Celebes (de Man); Amboina (Ortmann).

4. Caridina weberi de Man, 1892.

De Man, in: Weber, Zool. Erg., etc., II, 1892, p. 371, pl. 22, fig. 23.
De Man, Not. Leyden Mus., 14, 1892, pl. 9, fig. 8.

Geographical distribution: Sumatra; Java; Saleyer; Celebes; Flores (De Man).

5. Caridina japonica de Man, 1892.

De Man, Not. Leyd. Mus., 14, 1892, p. 261, pl. 9, fig. 7.

Geographical distribution: Japan: Kagar, Hayagana (De Man).

6. Caridina pareparensis de Man, 1892.

De Man, in: Weber, Zool. Erg., etc., II, 1892, p. 379, pl. 22, fig. 25.

Geographical distribution: Celebes (De Man).

7. Caridina timorensis de Man, 1893.

De Man, Not. Leyd. Mus., 15, 1893, p. 300, pl. 8, fig. 6.

Geographical distribution: Timor (De Man).

8. Caridina parvirostris de Man, 1892.

De Man, in: Weber, Zool. Ergebn., etc., II, 1892, p. 375, pl. 22, fig. 24.

Geographical distribution: Flores (De Man).

9. Caridina richtersi Thallwitz, 1891.

C. serrata Richters, Beitr. Meeresf. Maur. Seych. Decap., 1880, p. 163, pl. 17, figs. 24–27 (nomen præoccupatum).
C. richtersi Thallwitz, Abhandl. Mus. Dresden, 3, 1891, p. 27, foot-note.

Geographical distribution: Mauritius (Richters).

10. Caridina lævis Heller, 1862.

Heller, Sitz. Ber. Acad. Wiss., Wien, 45, 1, 1862, p. 411.
De Man, in: Weber, Zool. Ergebn., etc., II, 1892, p. 376, pl. 23, fig. 27.

Geographical distribution: Java (Heller, De Man).

11. Caridina multidentata Stimpson, 1860.

Stimpson, Proceed. Acad. Nat. Sci., Philadelphia, 1860, p. 29.
De Man, in: Weber, Zool. Ergebn., etc., II, 1892, p. 380, pl. 22, fig. 26.

Geographical distribution: Bonin Isl. (Stimpson); Celebes (De Man).

12. Caridina africana Kingsley, 1882.[9]

Kingsley, Bull. Essex Instit., vol. 14, 1882, p. 127, pl. 1, fig. 3.

Geographical distribution: S. Africa: Zulu Land (Kingsley).

[9] Having examined the types of this species in the Museum of the Academy of Nat. Sci., Philadelphia, I can give the following details:—

Carpal joint of the first pereiopoda twice as long as broad on the distal extremity, a little shorter than the hand. Fingers about equal to the palm. Carpal joint of the second pereiopoda four times as long as broad on the distal extremity, a little longer than the hand. Fingers about 1½ as long as the palm. Dactylus of the fourth pereiopoda about 1-5 of the propodus, the fifth pereiopoda are in none of the type specimens preserved.

13. Caridina fossarum Heller, 1862.

Heller, Sitzb. Acad. Wiss., Wien, 45, 1, 1862, p. 411.
De Man, in: Weber, Zool. Ergebn., etc., II, 1892, p. 397.

Geographical distribution: Persia: Schiraz (Heller).

14. Caridina serratirostris de Man, 1892.

De Man, in: Weber, Zool. Ergebn., etc., II, 1892, p. 382, pl. 23, fig. 28.

Geographical distribution: Flores; Saleyer; Celebes (De Man).

15. Caridina wycki (Hickson), 1888.

Atya wycki Hickson, Annal. Mag. Nat. Hist. (6), II, 1888, p. 357, pl. 13, 14.
Caridina wycki (Hicks.) Thallwitz, Abhandl. Mus. Dresden, 3, 1891, p. 27.
Caridina wycki (Hicks.) de Man, in: Weber, Zool. Ergebn., etc., II, 1892, p. 386, pl. 24, fig. 29–29k.
Caridina wycki (Hicks.) de Man, Not. Leyden Mus., 15, 1893, p. 302, pl. 8, fig. 7.
Caridina wycki (Hicks.) Ortmann, Jenaische Denkschr., VIII, 1894, p. 9.

Geographical distribution: From East-Africa to eastern Australia.—East-Africa: Dar-es-Salaam (Ortmann); Ceylon (Ortmann); Celebes (Hickson, Thallwitz, de Man); Saleyer (de Man); Flores (de Man); Timor (de Man); Queensland: Burnett (Ortmann).

16. Caridina nilotica (Roux), 1833.[10]

Pelias niloticus Roux, Annal. Sci. Nat., t. 28, 1833, p. 73, pl. 7, fig. 1.
Caridina longirostris Milne-Edwards, Hist. Nat. Crust., II, 1837, p. 363.
Caridina longirostris Lucas, Explor. Alger. Anim. Artic., 1849, p. 40, pl. 4, fig. 1.
Caridina longirostris Heller, Sitzb. Acad. Wiss., Wien, 45, 1, 1862, p. 412.
Caridina longirostris de Man, in: Weber, Zool. Ergebn., etc., II, 1892, p. 396, pl. 24, fig. 29l, 29m, 29mm.
Caridina longirostris Sharp, Proceed. Acad. Nat. Sci., Philadelphia, 1893, p. 111.

Geographical distribution: Northern Africa.—Nile (Roux); Algiers (Lucas, Sharp); River Macta, near Oran (Milne-Edwards).

17. Caridina grandirostris Stimpson, 1860.

Stimpson, Proceed. Acad. Nat. Sci., Philadelphia, 1860, p. 28.

Geographical distribution: Loo-Choo (Stimpson).

18. Caridina gracilirostris de Man, 1892.

De Man, in Weber, Zoolog. Ergebn., etc., II, 1892, p. 399, pl. 25, fig. 31.

Geographical distribution: Sumatra, Celebes, Saleyer, Flores (De Man).

19. Caridina singhalensis Ortmann, 1894.

Ortmann, Jenaische Denkschr., VIII, 1894, p. 9, pl. 1, fig. 2.

Geographical distribution: Ceylon (Ortmann).

[10] It is doubtful, whether the following quotations belong to this species or to *Car. wycki:*

C. nilotica Hilgendorf, Mon. Ber. Akad. Wiss., Berlin, 1878, p. 828.—Mozambique, Tette.

C. longirostris Richters, Beitr. Meeresf. Maur. Seych. Decap., 1880, p. 162.—Seychelles.

C. nilotica Pfeffer, Jahrb. Hamburg Wiss. Anstalt., VI, 1889, p. 35.—Zanzibar.

20. Caridina brevirostris Stimpson, 1860.

Stimpson, Proceed. Acad. Nat. Sci., Philadelphia, 1860, p. 29.

Geographical distribution: Loo-Choo (Stimpson).

DOUBTFUL SPECIES.[11]

Caridina denticulata de Haan, Faun. Japon. Crust., Dec. 6, 1849, p. 186, pl. 45, fig. 8.—Japan.

Caridina leucosticta Stimpson, Proceed. Acad. Nat. Sci., Philadelphia, 1860, p. 28.—Japan, Simoda.

Caridina serrata Stimpson, ibid., p. 29.—Hongkong.

Caridina acuminata Stimpson, ibid., p. 29.—Bonin Isl.

Caridina spathulirostris Richters, Beitr. Meeresf. Maur. Seych., 1880, p. 163, pl. 17, fig. 28.—Mauritius.

Caridina curvirostris Heller, 1862.

Heller, Verhandl. Zool. Bot. Gesellsch., Wien, 12, 1862, p. 525.
Heller, Crust. Novara, 1868, p. 105.
Miers, Catal. Crust. New Zealand, 1876, p. 78.

Geographical distribution: Auckland (Heller).

This species is provided with an supraorbital and an antennal spine, the spine at the base of the antennulæ is longer than the first joint.

It may belong to the genus *Xiphocaris* and may be identical with a species of *Xiphocaris* from the River Avon, near Christ Church, present in the Museum of Strassburg. Unfortunately I cannot give a description of these specimens and a comparison with Heller's species.

ATYOIDA Randall, 1839.

Randall, Journ. Acad. Nat. Sci., Philadelphia, VIII, 1839, p. 140.

This genus[12] has, up to the present time, been very doubtful. Examining specimens of *Atyoida bisulcata* from Oahu, Sandwich, in the Museum of the Academy of Natural Sciences of Philadelphia (No. 162), I find that the hands of the two anterior pairs of legs are wholly different from the typical *Atya*, in the same manner as figured by F. Müller in *Atyoida potimirim* (l. c., figs. 3 and 4). In

[11] The following three species described by Bate do not belong to *Caridina;* but to the family *Hippolytidæ:—*

Caridina truncifrons Bate, Proceed. Zool. Soc. London, 1863, p. 499, pl. 40, fig. 2, belonging to *Latreutes.*

Caridina cincinnuli Bate, ibid., p. 500, pl. 40, fig. 3, and *Caridina tenuirostris* Bate, ibid., p. 501, pl. 40, fig. 4, both belonging to *Virbius.* (All three from Australia, St. Vincents Gulf.

[12] *Atya serrata* Bate, Challenger Macrur, 1888, p. 699, pl. 119, fig. 2, from San Jago, Cape Verd Isl., and some other species described from the West Indies (see below), may belong to this genus. In *A. serrata* the rostrum is shorter and dentate below.

Atyoida the hands are formed like those of *Caridina:* the dactylus (movable finger) is inserted on the upper margin of the propodus, being shorter than the latter and forming a chela, as usual in the Decapoda, consisting of a palmar portion and two fingers. In *Atya*, on the contrary, the dactylus articulates with the propodus on the posterior end of the latter, both joints being exactly alike and forming a hand of a very peculiar shape among the Decapoda, the palmar portion being wholly reduced, and the hand consisting only of two fingers about alike in size, and connected with each other at the posterior ends. The carpal joint of the chelipeds in *Atyoida* is longer than in *Atya*, especially on the second pair of legs.

a_1. Rostrum dentate below. Carpal joint of the first pair of pereiopoda longer than broad *A. potimirim.*

a_2. Rostrum not dentate below. Carpal joint of the first pair of pereiopoda not longer than broad *A. bisulcata* (many).

1. Atyoida potimirim F. Müller, 1881.

F. Müller, Kosmos (Krause), IX, 1881, p. 117 ff, figs. 1–20.

Geographical distribution: Brazil: Itajahy (F. Müller).

2. Atyoida bisulcata Randall, 1839.

Atyoida bisulcata Randall, Journ. Acad. Nat. Sci., Philadelphia, VIII, 1839, p. 140, pl. 5, fig. 5.
Atyoida bisulcata Dana, U. S. Expl. Exp. Crust., 1852, p. 540, pl. 34, fig. 1.
Atyoida bisulcata Stimpson, Proceed. Acad. Nat. Sci., Philadelphia, 1860, p. 28.
Atyoida tahitensis Stimpson, ibid.
Atyoida bisulcata and *tahitensis* A. Milne-Edwards, Annal. Soc. Entomol., France (4), IV, 1864, pp. 151 and 152.
Atya bisulcata (Rand.), Bate, Challenger Macrur., 1888, p. 700, pl. 120.
Atya bisulcata (Rand.), Sharp, Proceed. Acad. Nat. Sci., Philadelphia, 1893, p. 111.

Geographical distribution: Hawaiian Isl. (Randall, Stimpson): Oahu (Dana, Sharp); Tahiti (Stimpson).

ATYA Leach, 1817.

Atys Leach, Trans. Linn. Soc. London, XI, 1815, p. 345 (nomen præoccupatum).
Atya Leach, Zoolog. Miscell., III, 1817, p. 29.

a_1. Rostrum shorter than the antennular peduncle, without teeth on the upper margin [Subgenus *Atya*].

b_1. Rostrum without lateral keels and without lateral teeth near the base.

c_1. Rostrum longer than the first joint of the antennulæ, horizontally projecting or sometimes bent upward. *A. moluccensis* (6).

c_2. Rostrum as long as or shorter than the first joint of the antennulæ, bent downward. *A. spinipes*[13] (12).

[13] *A. spinipes* might be regarded as a variety of *A. moluccensis.*

b_2. Rostrum with lateral keels ending by angles or short spines on each side of the base of rostrum.

c_1. Carapace not sculptured with keels, but often punctate. Third pair of legs (in the adult) without a spine on the inferior margin.

d_1. Rostrum very short. Lateral keels ending in front in angles, not in spines.

. *A. brevirostris* (3).

d_2. Rostrum longer. Lateral keels ending in front in spiniform angles.

e_1. Merus of the first two pairs of pereiopoda hairy.[14]

f_1. Rostrum straight.

. *?A. margaritacea* (3).

f_2. Rostrum bent downward.

. *?A. robusta.*

e_2. Merus of the first two pairs of pereiopoda not hairy (?) *A. scabra* (3).

c_2. Carapace strongly sculptured in front with keels. Third pair of legs on the inferior margin with a spine in adult specimens.[15] . . . *A. gabonensis* (1).

a_2. Rostrum as long as the antennal scale, upper margin with six to eight spines. Anterior part of carapace with numerous spines and spiny carinations [Subgenus: *Evatya* Smith] *A.* (*Evatya*) *crassa.*

1. Atya moluccensis de Haan, 1849.

A. moluccensis de Haan, Faun. Japon. Crust., Dec. 6, 1849, p. 186.
A. armata A. Milne-Edwards, Annal. Soc. Entomol., France (4), IV, 1864, p. 149, pl. 3, fig. 3.
A. armata v. Martens, Arch. f. Naturg., 34, 1, 1868, p. 47, pl. 1, fig. 6.
A. moluccensis d. H., Miers, Annal. Magaz. Nat. Hist. (5), V, 1880, p. 382, pl. 15, fig. 3, 4.
A. gustavi Ortmann, Zoolog. Jahrb., V, 1890, p. 467, pl. 36, fig. 9.
A. dentirostris Thallwitz, Abhandl. Mus., Dresden, 3, 1891, p. 26, fig. 7.
A. moluccensis d. H., de Man, in Weber, Zoolog. Ergebn. Reis. Niederl. Ost-Indien, II, 1892, p. 357, pl. 21, fig. 20.
A. moluccensis d. H., Ortmann, Jenaische Denkschr., VIII, 1894, p. 10.

Geographical distribution: Fresh-water of the Indian Archipelago. —Sumatra (de Man, Ortmann); Java (A. Milne-Edwards,[16] Miers, de Man); Batjan (Miers); Bali (Miers); Celebes (Miers, de Man,

[14] The differences between the New Caledonian species *A. margaritacea* and *robusta* and the West Indian *A. scabra* are very doubtful, since the anterior pereiopoda of the latter have the merus furnished with a few hairs. I suppose that the locality given by Milne-Edwards for *margaritacea* and *robusta* is not correct, and that there is no difference from *A. scabra.* (See below.)

[15] I think the differences of *A. gabonensis* and perhaps also of *A. crassa* are not of specific value, but that they are differences of age: *A. gabonensis* would be a very old state of *A. scabra*, but it may be that *A. crassa* is a distinct species.

[16] A. Milne-Edwards records his specimens, l. c., erroneously from the Philippine Islands (see de Man, l. c., p. 357, foot-note).

Thallwitz); Saleyer (de Man); Ceram (v. Martens); Timor (de Man); Flores (de Man); Amboina (Ortmann); Philippine Islands: Samar (v. Martens).

2. Atya spinipes Newport, 1847.

A. spinipes Newport, Annal. Magaz. Nat. Hist., XIX, 1847, p. 159.
A. pilipes Newport, ibid., p. 160.
A. spinipes and *pilipes* Newp., A. Milne-Edwards, Annal. Soc. Entomol., France (4), IV, 1864, pp. 149, 150.
A. pilipes Newp., Miers, Catal. Crust., New Zealand, 1876, p. 79.
A. spinipes and *pilipes* Newp., Miers, Annal. Magaz. Nat. Hist. (5), V, 1880, p. 282, pl. 15, figs. 5, 6.
A. pilipes Newp., Ortmann, Zoolog. Jahrb., V, 1890, p. 466, pl. 36, fig. 8.

Geographical distribution: This species represents the *A. moluccensis* in the fresh-water of the Pacific Islands.—Philippine Islands (Newport); Caroline Isl. (Ortmann); Fiji Isl. (Ortmann); Samoa Islands (Newport, Miers, Ortmann).[17]

3. Atya brevirostris de Man, 1892.

De Man, in: Weber, Zoolog. Ergebn., etc., II, 1892, p. 360, pl. 21, fig. 21.
Ortmann, Jenaische Denkschr., VIII, 1894, p. 10.

Geographical distribution: Flores (De Man); Timor (De Man); Amboina (Ortmann).

? 4. Atya margaritacea A. Milne-Edwards, 1864.

A. Milne-Edwards, Annal. Soc. Entomol., France (4), IV, 1864, p. 148, pl. 3, fig. 2.
Ortmann, Zoolog. Jahrb., V, 1890, p. 465, pl. 36, fig. 7.

Geographical distribution: New Caledonia (A. Milne-Edwards).

? 5. Atya robusta A. Milne-Edwards, 1864.

A. Milne-Edwards, ibid., 1864, p. 148, pl. 3, fig. 1.

Geographical distribution: New Caledonia (A. Milne-Edwards).

6. Atya scabra Leach, 1815.

Atys scaber Leach, Trans. Linn. Soc. London, XI, 1815, p. 345.
Atya scabra Leach, Zoolog. Miscell., III, 1817, p. 29, pl. 131.
Atya scabra Desmarest, Consider. Génér. Crust., 1825, p. 217.
A. mexicana Wiegmann, Arch. f. Naturg., II, 1, 1836, p. 145.
A. scabra Leh., Milne-Edwards, Hist. Natur. Crust., II, 1837, p. 942, pl. 24, figs. 15–19, and Atlas, Cuvier's Regn. anim., pl. 51, fig. 4.
A. sulcatipes Newport, Annal. Magaz. Nat. Hist., XIX, 1847, p. 159, pl. 8, fig. 1.
A. occidentalis Newport, ibid.
A. scabra Leh., Stimpson, Boston Journ. Nat. Hist., VI, 1857, p. 498.
A. scabra, sulcatipes, and *occidentalis* A. Milne-Edwards, Annal. Soc., Entomol., France (4), IV, 1864, pp. 146, 147.
A. rivalis and *tenella* Smith, 2 and 3 Rep. Peabody Acad. Sci., 1871, p. 94.
A. scabra and *occidentalis* v. Martens, Arch. f. Naturg., 38, 1, 1872, p. 135.
A. punctata Kingsley, Proceed. Acad. Nat. Sci., Philadelphia, 1878, p. 91.
A. occidentalis Newp., Kingsley, ibid., p. 92.
A. sulcatipes Newp., Bate, Challenger Macrur., 1888, p. 694, pl. 118, 119, fig. 1.
A. occidentalis Newp., Pocock, Annal. Mag. N. H. (6), III, 1889, p. 11, pl. 2, fig. 3.
A. scabra Leh., Sharp, Proceed. Acad. Nat. Sci., Philadelphia, 1893, p. 111.

[17] The locality, "New Zealand," given by Newport is an error.

Geographical distribution: Fresh-water of the West Indies and the Cape Verde Islands.—Mexico (Wiegmann, Milne-Edwards, v. Martens, Stimpson, Sharp); Nicaragua (Smith); Cuba (v. Martens); Hayti (Kingsley); Jamaica (Newport); Dominica (Pocock); Martinique (Sharp); Tobago (Mus. Strassburg[18]).—Cape Verde Islands: San Nicolao (Newport); San Jago (Bate).

7. **Atya gabonensis** Giebel, 1875.
Atya gabonensis Giebel, Zeitschr. f. d. gesammt. Naturwiss. (2), XI, 1875, p. 52.
Euatya sculptilis Kölbel, Sitz. Ber. Acad. Wiss. Wien, vol. 90, 1, 1884, p. 317, pl. 2, fig. 8, pl. 3.
Ayta sculptata Ortmann, Zoolog. Jahrb., V, 1890, p. 465.

Geographical distribution: Gaboon (Giebel); Orinoco (Kölbel).

8. **Atya (Evatya) crassa** Smith, 1871.
Smith, 2 and 3 Rep. Peabody Acad. Sci., 1871, p. 95.
Kölbel, Sitzb. Acad. Wiss., Wien, vol. 90, 1, 1884, p. 318, foot-note.

Geographical distribution: Nicaragua (Smith); Mexico: Presidio (Kölbel).

Doubtful Species.

Atya poeyi Guérin, Crust. in Ramon de la Sagra, Hist. de l'île de Cuba, 1857, p. 46, pl. 2, fig. 7.—Cuba.

Caridina mexicana Saussure, Mem. Soc. Phys. Hist. Nat. Genève, 14, 2, 1858, p. 463, pl. 4, fig. 26.—Mexico.

Atyoida glabra Kingsley, Proceed. Acad. Nat. Sci., Philadelphia, 1878, p. 93.—Nicaragua.

Atya serrata Bate, Challenger Macrur., 1888, p. 699, pl. 119, fig. 2.—Cape Verde Isl.: San Jago.

These species may be the young of *A. scabra* or may belong to *Atyoida*.

Considerations concerning the geographical distribution of the Atyidæ.

Some species of *Atyidæ* were formerly considered to be marine animals; there is now no doubt that this family contains only fresh-water forms. This family is probably one of the most primitive groups of Decapoda living in fresh-water, having immigrated at an early geological period.

Only two species, *Caridina wycki* and *gracilirostris*, are recorded by Weber[19] as found in a few cases in brackish waters of Sumatra

[18] This locality is not yet published: there is one adult male fromTobago in the museum at Strassburg.

[19] Die Süsswassercrustaceen der Indischen Archipels.—Zoolog. Ergebn. Reise Niederl. Ost.-Indien., II, 1892, p. 542.

and Celebes.[20] I believe, that this occurrence may be considered as a re-adaptation of these two species, as they are found also in fresh-water. Since the genus *Caridina* is not a primitive one, while the genera of the *Xiphocarinæ* are so, and live exclusively in fresh-water, it is very probable, that the fresh-water habit of the family must be regarded as the original manner of living. I believe, therefore, that the *Atyidæ*, even of the Indian Archipelago, are not immigrants from the sea, as stated by Weber (l. c., p. 543), but "true localized fresh-water animals, forming an old element of the fresh-water fauna."[21]

The main differences of the *Atyidæ* and their supposed ancestors, the *Acanthephyridæ*, are morphological as well as biological, the *Acanthephyridæ* being true marine, and essentially abyssal animals. To all appearance the morphological differences are causally connected with the change of habits. The peculiar pencil of hairs at the distal extremities of the fingers is adapted for securing the special food required, as described by F. Müller in *Atyoida potimirim*.[22] No doubt the other species of *Atyidæ* feed in the same manner. I cannot say whether the absence of the synaphipod of the mandible is due to the same cause, since the function of the synaphipod is unknown, but it may be in connection with it. On the other hand the habits of the *Acanthephyridæ* are wholly unknown, so that we cannot compare this family with the *Atyidæ*, but it is very probable that the morphological differences of the *Acanthephyridæ* correspond to differences in the habits, especially in securing food.

We can state, briefly, that the *Atyidæ* are closely allied to the most primitive *Eucyphidea*, forming a peculiar branch of development very early separated from the main stem, now represented by the *Acanthephyridæ*. Their several characters are connected with a change of habit, and with the immigration to fresh-waters.

The geographical range of the *Atyidæ* embraces the whole of the circumtropical parts of the world, members of the family being recorded from all the localities explored within these limits. Only in two localities does the range exceed the true tropics: in Japan, where it extends as far north as Tokio, and in the Mediterranean province,

[20] See de Man, ibid., pp. 387, 399, 400.
[21] Weber, l. c., p. 533: "echte regionale und locale Süsswassertiere, die einen alten Bestand der Süsswasser Fauna bilden."
[22] Kosmos, IX, 1881, p. 117 ff.

where it extends northward to southern France and southern Austria. This nearly exclusive distribution within the tropics, at least in the warmer climates, shows that the family was probably also in former times an inhabitant of the warmer parts of the world, and the possibility is granted that the immigration into fresh-water took place at a time when climatic zones were not at all differentiated, a tropical climate prevailing everywhere. If this immigration took place in a later time, the poles having undergone a cooling, one could not understand the presence of the family in all parts of the tropics, as well as the occurrence of some genera (*Xiphocaris, Caridina, Atya*) on both of the present great continents, the eastern and western.

After the cooling of the northern and southern circumpolar regions[23] the range of the family was divided into two parts: an eastern comprising the tropical Africa, Asia, Australia, and the Pacific islands, and a western comprising tropical America.[24] The most primitive genera of the family were restricted in range by the concurrence of the more extremely developed ones, and the latter preserved a more circumtropical distribution.

It is very interesting to examine the geographical range of the genera and species from the point of view here given.

The most primitive genus, *Xiphocaris*, shows a distribution the peculiarity of which can only be understood by supposing that the range of this genus was formerly a more extended one, but that in most parts of the world the representatives were exterminated. Only three species survived, one of which lives now in the fresh-waters of the West Indies, the other in Indo-Malaysia, from Japan to Australia, and the third in New Zealand. From the intermediate countries species of this genus are not recorded. The Indo-Malaysian species, *Xiphocaris compressa*, repeats, as we know at present, this peculiarity in a reduced manner, being only recorded from Japan, the island of

[23] See Ortmann Jenaische Denkschr., VIII, 1894, p. 74, and Pfeffer, Versuch über die erdgeschichtliche Entwickelung der jetzigen Verbreitungsverhältnisse unseres Thierwelt. Hamburg, 1891.

[24] In case the *Atyidæ* immigrated from the sea into the fresh-water after this separation, it is very probable that the geographical distribution would not be a circumtropical one, but that different groups immigrated into the western and eastern continents. We know another group of Decapoda, in which the latter is the case: the family *Telphusidæ*, one subfamily of which the *Telphusinæ*, being restricted to the tropical and subtropical parts of the eastern continents (Mediterranean, African, Indian, Indo-Malaysian, etc.), two other subfamilies, *Trichodactylinæ* and *Pseudotelphusinæ*, being restricted to the tropical parts of America.

Adenare, and from Queensland.[25] The closely allied genus *Troglocaris*, the only species of which might be regarded as a fourth form of *Xiphocaris*, lives in the subterranean waters of Carniola, a perfectly isolated locality in no way connected with the others named. The third primitive genus, *Atyaëphyra*, is found near the locality of *Troglocaris* on the northern borders of the Mediterranean Sea. It is somewhat less primitive. The scattered localities at which are found the species of these three genera forming the subfamily *Xiphocarinæ* are no doubt the remains of a more universal distribution in former times: the species now living show the character of true survivals.

In the subfamily *Atyinæ*, the genus *Atyoida* shows a survival character similar to that of the *Xiphocarinæ;* being recorded from the Sandwich Islands, Tahiti, and southern Brazil. But this genus must be the subject of farther study.

The genus *Caridina* appears to be nearly a circumtropical one. Its range is divided into two very unequal parts: the one comprising the West Indies and containing only one species, the other comprising a continuous area of the old world and containing at least nineteen other species. This area extends from South Africa along the east coast to the southern borders of the Mediterranean Sea and to Persia, crossing the islands of the Indian Ocean and Indo-Malaysia to Japan and Australia.[26] Species of this genus have not yet been found in West Africa, in southern Asia (except Ceylon and Siam), and in the Pacific islands, but it may be that some species will be discovered later in these countries.

This distribution of the genus can only be understood by supposing that it was present before a separation of the eastern and western parts of the tropics took place, and that the extended range of former times is now restricted to the tropical parts of the continents bordering the Indian Ocean and to its islands, and to the islands of eastern Asia from Japan to Australia. The occurrence of one species in the Nile and in the rivers of Algiers is due, I believe, to a more recent immigration from the central and eastern parts of Africa, not unlike the occurrence of *Palæmon nitolicus*.[27]

[25] It may be that this species will be found on other islands between Asia and Australia, but it is very remarkable that the large collections of freshwater Crustacea made by M. Weber in the Indian Archipelago, and described by de Man, do not contain this species.

[26] A poorly described species is recorded from the Cape Verde Islands.

[27] See Ortmann, Zoolog. Jahrb., V, 1891, p. 745.

It is very probable that farther investigations will prove that the range of *Caridina* is a somewhat different one, since fresh-water crustacea of smaller size are mostly neglected by collectors, and the fauna of the fresh-waters of most tropical countries are very little known. Accordingly, the view given above on the geographical distribution of *Caridina* may, perhaps, have to be changed later.

The distribution of the most extreme genus of the family, *Atya*, is somewhat similar to that of *Caridina*. It is found, like the latter, in the West Indies and Indo-Malaysia, but there are some modifications. One species is known from West Africa, which is identical with another described from the Orinoco, and there is recorded one species from the Cape Verde Island, identical with the common West Indian form. The presence of identical fresh-water species, both in the West Indies and in West Africa, is a very remarkable fact, but not an isolated one among the Decapoda. We know another group of fresh-water Crustacea which shows the same peculiarity. Of the genus *Palæmon* there are three species described from West Africa, two of which, *Pal. jamaicensis* (=*vollenhoveni*) and *Pal. olfersi*, are likewise present in the West Indies, and one, *Pal. macrobrachion*, is closely allied to a West Indian species, *Pal. acanthurus*.[28] In *Atya* the identity of species of both continents bordering the Atlantic is due, no doubt, to other reasons than in *Palæmon*, the latter being a very recent genus, having immigrated to the fresh-waters quite recently, while some species are now immigrating from the sea to brackish and fresh-water. On the contrary, the immigration to fresh-water of the ancestors of *Atya* took place a long time ago, and, I think, this fact indicates a former connection of Africa and America.

The other range of the genus *Atya* extends over the islands of the Pacific from Sumatra to the Samoan islands. None is recorded from southern Asia, from the islands of the Indian Ocean, or from East Africa.[29]

The two species described by A. Milne-Edwards from New Caledonia, *A. margaritacea* and *robusta*, are very doubtful, as I have stated above. I do not know another example of a fresh-water

[28] See Ortmann, ibid., p. 747.—*Palæmon vollenhoveni* is certainly the same as *Pal. jamaicensis*; in the paper quoted I supposed them to be nearly allied, but distinct species.

[29] Only Hilgendorf (v. d. Decken's Reisen, III, 1, 1869, p. 101) records a very doubtful species from the Seychelles, belonging, perhaps, to *Atyoida*.

Decapod restricted to New Caledonia. Our present knowledge of the fresh-water fauna of the Pacific islands leaves it very improbable that New Caledonia has an isolated fauna, differing from that of the other islands. It is probable, on the contrary, that species found in New Caledonia will be found also in other islands, but since A. Milne-Edwards, in 1864, described these two species, they have never been recorded from any place in the Pacific. It may be added that the differences of these species from the West Indian, *A. scabra*, given by A. Milne-Edwards, are scarcely at all present. I am, therefore, induced to suppose that both are erroneously recorded from New Caledonia, the true locality being the West Indies, and that they are identical with *A. scabra*.

If these considerations are correct, the genus *Atya* can be divided into two groups: the one containing the species bearing on each side of the rostrum at the base a spiniform angle, the other containing the species without a spiniform angle. To the first belong the species *A. scabra*, *gabonensis*, and *crassa*, their range extending over tropical America and West Africa; to the second belong *A. moluccensis*, *spinipes*, and *brevirostris*, the range of which comprises the Indo-Malaysian and Pacific islands. The last named species, *brevirostris*, forms a transition from the second group to the first. Then the range of the genus *Atya* would be divided into two parts, each containing a separate group of the genus, and this peculiarity could be explained by supposing that these two groups may be developed separately from each other after the separation of the former connecting range of the genus. This conjecture agrees with the fact, that *Atya* is the most extreme genus of *Atyidæ*, and with its supposed recent age.

We know that some fresh-water animals are rapidly distributed over great distances, either in the adult or in the larval state, but in the *Atyidæ* we know nothing of the means of distribution.

Comparing the other Crustacean Decapoda we may say, that the *Atyidæ* have not been transported to great distances. Nor is it probable that the eggs can endure a long time without water, or that the larvæ or the adult animals can leave the water for any length of time. Transportation of the species of *Atyidæ*, in either the active or passive state, from one fresh-water system to another over the land or through the air, cannot be supposed, at least over great distances. Neither can the *Atyidæ* live in the sea, so that the

most important *topographical barriers* to distribution would be widely extending oceans and large tracts of land without fresh-water. The Pacific Ocean forms a barrier of the first kind, while the second may be partly connected with the *climatic conditions* of the warmer parts of the world. Smaller areas of sea and land, however, may be crossed by some forms, as is shown especially in the distribution of some species of *Caridina* and *Atya*[30]. The means of distribution are certainly very limited, and therefore a great number of species are confined to very narrow districts.

Lastly, the ancient character of the family induces me to suppose that there are also bionomic barriers, the *Atyidæ* not being able to immigrate to localities occupied by other fresh-water animals better equipped for the struggle for existance.

I regret very much that exact observations on the habits of the species of *Atyidæ*, on the biology and bionomy, are wholly absent. It is very probable that the different genera and species on farther examination will show some differences, especially that the best developed are more resistant to external influences.

The conditions of geographical distribution of the *Atyidæ* are as follows:—

1. The *Atyidæ* cannot endure cooler climates. (*Climatic barriers.*)
2. They are true fresh-water animals. (Oceans and tracts of land without water form *topographic barriers.*)
3. Being animals of an ancient type, they are probably restricted by the occurrence of other fresh-water animals. (*Bionomic barriers.*)
4. The faculties of distribution are very limited.

The *Atyidæ* are, therefore, confined to the fresh-waters of the tropics and subtropics; the distribution of the genera and species, especially of the more primitive ones, shows a remarkable character of survival. Only *Caridina* and *Atya* are of a more recent character, extending over continuous areas within the tropics. Because of the antiquity of the family it has no relations among the recent forms of the litoral regions of the tropical seas.[31]

[30] *Caridina typus, wycki, nilotica; Atya scabra, moluccensis, spinipes.*

[31] Such relations to the *Atlantic*, *Indo-Pacific*, and *Western-American* regions (see Ortmann, Jenaische Denkschr., VIII, 1894, p. 76) are not at all evident, none of the well-known genera or species being limited by the borders of one of these regions.

NOVEMBER 6.

The President, GENERAL ISAAC J. WISTAR, in the Chair.

Forty-one persons present.

A paper entitled "The Batrachia and Reptilia of the University of Pennsylvania West Indian Exploration of 1891," by Edw. D. Cope, was presented for publication.

NOVEMBER 13.

The President, GENERAL ISAAC J. WISTAR, in the Chair.

Thirty-nine persons present.

Papers under the following titles were presented for publication:—

"The Structure and Relationships of Ancodus," by W. B. Scott.

"A Supplementary Note to Mr. Johnson's List of Jamaica Diptera," by T. D. A. Cockerell.

NOVEMBER 20.

The President, GENERAL ISAAC J. WISTAR, in the Chair.

Ninety-five persons present.

The deaths of the following members were announced:—

Robert E. Peterson, Archibald McIntyre, Samuel Jeanes and Joseph Jeanes.

A paper entitled "A New Jumping Mouse from the Pacific Slope," by Samuel N. Rhoads, was presented for publication.

DR. JOHN MACFARLANE read a communication on the Movements of Plants under Plates of Colored Glass. (No abstract.)

NOVEMBER 27.

The President, GENERAL ISAAC J. WISTAR, in the Chair.

Fifty-eight persons present.

Papers under the following titles were presented for publication:—

"The Osteology of Hyænodon," by William B. Scott.

"A New Insectivore from the White River Beds," by William B. Scott.

"Some New Bees of the Genus Perdita," by T. D. A. Cockerell.

"Pterodrilus, a Remarkable Discodrilid," by J. Percy Moore.

The Publication Committee reported in favor of publishing a paper entitled "The Structure and Relationships of Ancodus," by William B. Scott, in the Journal of the Academy.

William L. Whitaker and J. Carroll McCaffrey were elected members.

The following were ordered to be printed:—

A SUPPLEMENTARY NOTE TO MR. JOHNSON'S LIST OF JAMAICAN DIPTERA.

BY T. D. A. COCKERELL.

I was very much pleased to receive from Mr. Johnson his list of Jamaican Diptera, which will form a good foundation for a better knowledge of the subject. The purpose of this supplementary note is to point out a few omissions; and also to add a few species which were determined for me at the U. S. National Museum.

CECIDOMYIDÆ.

Diplosis coccidarum Ckll., Entom., 1892, p. 181. Kingston.

CHIRONOMIDÆ.

Œcacta furens Poey, Twns., Jn. Inst. Jamaica, I, p. 381.

PSYCHODIDÆ.

Psychoda sp.

Will be elsewhere discussed by Dr. Williston.

TIPULIDÆ.

Limnobia sp. incert., Balaclava (Ckll.), in U. S. N. M.

STRATIOMYIDÆ.

Cyphomyia n. sp. (not named). Williston, Canad. Ent., 1885, p. 125.
Pachygaster pulcher Lw. Mandeville (Ckll.), in U. S. N. M.

SYRPHIDÆ.

Pteroptila sp. (not *cincta*). Ckll., Jn. Inst. Jamaica, I, p. 74.

See also a forthcoming paper on Syrphidæ by Prof. Townsend.

MUSCIDÆ.

Musca domestica L., Ckll., Jn. Inst. Jamaica, I, p. 56. Kingston.

MICROPEZIDÆ.

Calobata fasciata Fb. New locality, Mandeville (Ckll.), in U. S. N. M.

TRYPETIDÆ.

Trypeta (Acrotoxa) suspensa Lw., var. Mandeville (Ckll.), in U. S. N. M.

PHORIDÆ.

Phora scalaris Lw. Mandeville (Ckll.), in U. S. N. M.

HIPPOBOSCIDÆ.

Trichobius dugesii Twns. Ckll., Jn. Inst. Jamaica, I, p. 98.

With these, the known Jamaican Diptera amount to 125 species.

A NEW JUMPING MOUSE FROM THE PACIFIC SLOPE.

BY SAMUEL N. RHOADS.

Zapus trinotatus sp. nov. Type, ad ♂, No. 360, Coll. of S. N. Rhoads. Lulu Island (mouth of Frazer River), British Columbia, May 31st, 1892. Col. by S. N. R.

Description.—Size large, equalling *Zapus princeps* from Colorado, but with a shorter foot. Colors above as in *princeps*, but darker, the yellowish-gray suffusion on back and sides of that species being replaced in *trinotatus* by brownish-fulvous; the cheeks, ears, upper head, circumocular region, and upper surface of tail much blacker. The upper surface of wrist is black with fulvous anterior edging reaching to foot. Lateral stripe separating upper and lower body colors, dark fulvous, narrow, and reaching from hams to and around front of fore legs, and nearly meeting across throat. The throat, chin, belly, vent, and lower (inner) surfaces of legs are a clear soft white. In the center of lower throat and on each side of the sternum is a well-defined spot of fulvous about 8 mm. long and 3 mm. wide, the pectoral spots being the larger and more strongly colored. The fulvous of these spots does not reach base of hairs, their roots being white, as in the hairs of the fulvous lateral stripe.

Skull differing from any described form in its great relative width and depth, to length, the zygomæ being more flaring, the parietals more convex, the incisive foramina larger and broader posteriorly, the postpalatal notch more acuminate and indenting the palatal bones as far as m. 2. The upper premolar is larger than in *princeps* or *hudsonius*, its crown rising to the grinding plane of the true molars and becoming functional, bearing on its inner and posterior rim a crescentine loop partially enclosing a central cusp whose base lies on the outer anterior angle of the crown. In *princeps*, its nearest ally, this tooth is not functional, or rarely so, its apex falling below the grinding plane, and, as in *hudsonius*, consisting of a simple peg-like process with the folding being more or less obsolete. The lower molars of *trinotatus* are relatively larger than in *princeps* or *hudsonius*, the posterior loop of m. 1 and the second and last loops

of m. 2 projecting exteriorly beyond the outer edges of their intervening loops, forming a very irregular outline not seen in the latter species. In *trinotatus* the inferior m. 3 is relatively large, one-and-a-half times as long as wide and made up of a more complicated series of loops than in the same tooth of its allies. The coronoid process is much lengthened, wide across base, blunt and distinctly notched at tip. The angular process of mandible is perforated by a single minute foramen; in the other forms it is multiperforate or incised by two, conspicuous, oblique slits.

Measurements of Type (in millimeters).—Total length, 234; tail vertebræ, 139; hind foot, 32. (Topotype, length, 235; tail, 142; foot, 32.) Skull—Total length, 24; basilar length, 17.5; zygomatic width, 13; nasal length, 9.8; interorbital constriction, 4.8; height of cranium, 9.8; length of mandible, 12.5; width of mandible, 6.8.

Two males of this species were taken at Lulu Island. Another from Mason Co., Washington, is referable to it.

Zapus trinotatus is the West Cascade representative of *Z. princeps*. Several specimens of jumping mice taken at Lac La Hache, B. C., and at Vernon, in the same province, are referable to *princeps*, whose range will probably be found to be limited to the East Cascade and Rocky Mountain regions of the United States and of southern British America. It is probable that the range of *hudsonius* will be found to reach far to the west in northern British America.

I am indebted to Mr. G. S. Miller, Jr., for the loan of specimens of *Z. princeps* for this study.

ON A COLLECTION OF BATRACHIA AND REPTILIA FROM THE ISLAND OF HAINAN.

BY E. D. COPE.

The collection on which the following notes are based was made by the Rev. Francis Gilman, who sent them to Prof. Chas. S. Dolley. Prof. Dolley placed them in my hands for identification and description.

Hyla arborea var.

This form agrees in structural features with the true *Hyla arborea* of Europe, but differs in coloration, not only from this but from the two subspecies which are known from Eastern Asia (*H. a. chinensis*, and *H. a. japonica*).

The extended hind limb marks a point between the eye and the nostril with the heel. The vomerine teeth are between the internal nostrils, but the posterior borders of the fasciculi are behind a line which connects their posterior borders. The diameter of the tympanum is about half that of the eye; and the interorbital width is greater than that of an eyelid. The length of the head to a line connecting the posterior borders of the tympana, enters the total length 3.2 times. The fingers are slightly webbed, and the toes are about two-thirds webbed. There is a heavy glandular fold from the orbit to the shoulder.

The color is uniform green above, and uniform pale (perhaps yellowish) below. There are no spots of any kind anywhere. A light brown band extends from the eye through the tympanum and disappears about the shoulder. It has neither dark nor pale borders, and is hence very indistinct. A similar band extends from the eye to the nostril. Upper lip not pale bordered nor spotted. Total length, 40 mm.; do. of hind leg from groin, 59 mm.; of hind foot, 27 mm.

Holarchus dolleyanus sp. nov. Plate X, fig. 1.

Scales in seventeen rows. Superior labials eight, all higher than long, the fourth and fifth entering the orbit, the sixth in contact with the inferior postocular only, the seventh in contact with the lower postocular, and more extensively with the parietal. Loreal trape-

zoid; oculars 1–2; temporals 0–2. Internasal mutual contact short; parietals short, wide, truncate posteriorly, bounding both postoculars posteriorly. Pregenials bounded by four labials, a little longer than postgenials. Gastrosteges, 164, obtusely angulated; anal entire; urosteges, 36.

Color above yellowish-brown; below brownish-yellow. No marks on the head; on the superior surface of the body there are indistinct cross bars, which consist of the dark edges of scales, at intervals of two and three scales; they are not continued on the tail. Total length, 400 mm.; of tail, 58 mm.

This species probably resembles the *H. swinhonis* Gthr. (Rept. Brit. India, p. 215, Pl. XX, fig. E.); but it differs materially in having but one preocular; in the absence of an anterior temporal; in the contact of the anterior genial with four labials, and in the longer postgenial. The color above is pale brown, not olive.

The hemipenis of this species is smooth, and without spines, flounces, or ruches; agreeing with that of the *H. ancorus*, as figured by me in the "American Naturalist," 1894, Plate XXVII, fig. 4. These characters refer the genus to the Calamariinæ, with *Oligodon*, etc. (See "American Naturalist," 1893, p. 480.) A character of subordinate value seen in the hemipenis of *H. ancorus*, which is not present in *H. dolleyanus*, is a shallow pocket on each side of the sulcus spermaticus.

There is a rudimental right lung 5 mm. in length, communicating with the trachea by foramen. No tracheal lung.

This species is dedicated to my friend, the distinguished zoologist, Dr. Chas. S. Dolley.

Pareas mœllendorffii Bœttger.

A single male specimen gives me an opportunity of determining the position of this curious genus. With some external resemblance to the American *Leptognathus*, it combines not dissimilar dentition and squamation; it is to be presumed that the habits are not dissimilar. Examination of the hemipenis shows, however, that it is really related to the Calamariinæ, and to *Simotes*. This organ is without spines or ruches, and has only flat obtuse papillæ on the middle third of its length, the distal portion being smooth, with a few feeble papillæ at the apex. It is deeply bifurcate, the basal portion being quite short. At the summit of the middle papillose

section is an oblique membranous flounce with a lobate margin. No tracheal lung; and I could find no right lung.

Amphiesma stolatum L.

In this species the hemipenis displays the usual natricine characters of a basal hook, and small spines reaching to the apex, without ruches or flounces. The spines are, however, coarser than in most other species. The organ, moreover, is undivided, and with undivided sulcus, and as *A. stolatum* is the type of the genus, the latter must be defined accordingly, and not as divided, as I inferred from an examination of allied species which have been referred to it by authors.[1] These supposed species of *Amphiesma* which I have examined, which have divided hemipenis and diacranterian dentition, are also characterized by the presence of fossæ of the hemipenis from the center of each of which a spinule issues. These are the *Amph. tigrinum* and *A. ceylonense*, and they belong to my genus *Bothrodytes*, which name should take the place of *Amphiesma* in my original Prodromus, l. c. The genera of Natricinæ with basal hooks will then be as follows :—

I. Fusiform types; hemipenis and sulcus undivided.
Hemipenis simple; anal divided;

One internasal, scales keeled;	*Haldea* B. & G.
Two internasals, scales keeled;	*Amphiardis* Cope.
Two internasals, scales smooth;	*Virginia* B. & G.

Hemipenis with two apical papillæ; anal entire.

Two internasals; scales keeled;	*Tropidoclonium* Cope.

II. Colubriform types.
a. Hemipenis undivided.
b. Dentition syncranterian or isodont.

Anal plate entire; a loreal;	*Eutænia* B. & G.
Anal plate divided; no loreal;	*Storeria* B. & G.
Anal plate divided; a loreal;	*Natrix* Laur.
Anal plate divided; a loreal; one prefrontal;	*Trimerodytes* Cope

bb. Dentition diacranterian.

Scales keeled; two internasals;	*Amphiesma* D. & B.
Scales smooth; one internasal;	*Liodytes* Cope.

aa. Hemipenis divided.
b. Dentition syncranterian.

[1] American Naturalist, 1893, p. 483.

Hemipenis with two apical papillæ; *Ceratophallus* Cope.
Hemipenis without papilla; *Diplophallus* Cope.

bb. Dentition diacranterian.

Hemipenis without papilla; *Bothrodytes* Cope.

Trimerodytes balteatus gen. et sp. nov. Plate X, fig. 2.

Char. gen.—Characters of *Natrix*, but the prefrontals fused. The dentition is syncranterian or coryphodont. Hemipenis undivided, sulcus simple.

The single species on which this genus is proposed is represented by an individual which, while apparently not very young, is at the same time not fully grown. As a consequence the spinules of the hemipenis are not ossified, appearing as fine flexible papillæ. This is the condition normal to immature snakes, as I have observed in the genera *Drymobius*, *Bascanium*, etc.

Char. specif.—Scales in nineteen rows, smooth, except on the tail, where all except the lateral rows are feebly keeled, and for a short distance in front of the vent, where about three dorsal rows are also weakly keeled. Each internasal longer than wide. Frontal rather wide, with straight borders, the anterior a little longer than the lateral. Parietal moderately elongate, angulate posteriorly, and embracing only the superior postocular. Loreal higher than long; oculars 1–2 or 3; temporals 1–2. Superior labials nine. These are differently distributed on opposite sides, so that the numbers may be in other specimens, eight or ten. One labial forming most of inferior border of orbit, which may be the fourth or fifth; the angle of the succeeding labial enters the orbit. On one side two plates represent the single last upper labial on the other. Inferior labials nine; pregenials shorter than postgenials, and bounded by six labials. Gastrosteges, 202; anal, 1–1; urosteges, 84.

Color black, crossed by white or pale yellow rings. These have a width of half of a scale on the middle dorsal region, and widen downward, covering two or three gastrosteges. They are frequently broken on the middle line, the halves alternating, both on the back and belly. The labials and oculars have yellow centers, and there is a yellow line from near the angle of the mouth to near the middle line above. A pair of yellow spots are on each side of the common suture of the parietal plates.

Total length, 377 mm.; tail, 80 mm.

Bothrops erythrurus Cantor.

Before leaving the Ophidia I add some remarks on the penial characters of some species which do not enter the present collection, and which I have recently examined.

The genus *Anomalodon* Jan (*Lioheterodon* Boulenger, from a nom. nud. of Dum. & Bibr.) has the hemipenis deeply divided and covered with minute spines, without large hooks at the base. It is to be referred to the Pseudaspidinæ of my Prodromus, approaching the genus *Pseudaspis* m. of S. Africa. Boulenger has shown that it has the natricine hypapophyses.

The Australian *Dipsas fusca* Gray, differs from the genus *Dipsas* in the absence of spines from the hemipenis; the characters are otherwise as in *Dipsas*. I propose to name this new genus *Liophallus*, with *L. fuscus* as type.

I propose to separate *Drymobius percarinatus* Cope from *Drymobius* as the type of a distinct genus under the name of *Cacocalyx*. It differs from that genus in the structure of the terminal half of the hemipenis. Instead of the usual papillose calyces, there are rows of spines on longitudinal folds, and the apex is covered with a few large, shallow, smooth-edged calyces, which are separated from the spinous portion by a continuous transverse fold, *i. e.*, the apex is capitate. I have compared this organ with the corresponding ones of *Drymobius margaritiferus* (type); *D. pantherinus; D. reticulatus; D. boddaertii*, and *D. pulcherrimus*, where they are essentially alike. The genus *Cacocalyx* is quite different from any other form of Colubrinæ.

The *Cyclophis major* Gunth., presents the penial characters of the Colubrinæ, but has an especial peculiarity not shared by any other species with which I am acquainted. In the proximal internal wall of each calyx is a transverse comb of a few spines. These do not graduate into the spines of the middle of the hemipenis, which are well developed. The borders of the calyces are serrate to papillose. As this type is clearly not referable to any known genus, I propose to distinguish it by the name of *Entechinus*. It is evidently not very nearly related to *Liopeltis* and *Cyclophis* of N. America.

The genus *Macroprotodon* (Guich.) has the apical region of the hemipenis calyculate, and the papillæ at the angles of the calyces are spinous (*i.e.*, ossified) to near the tip. There are numerous

spines below the calyces. Hemipenis simple. The genus belongs to the Dipsadinæ.

Psammodynastes has a divided penis which is spinous to the tip and not calyculate. The spines are arranged in the branches in oblique series, pinnate to the sulcus. Not knowing the structure in *Psammophis* I cannot determine the affinity of the genus.

In *Osceola* (*elapsoidea*) the penial characters are like those of *Ophibolus doliatus;* i. e., the calyces are numerous and fringed. In *Ophibolus* they are very few and have entire borders. I therefore place *O. doliatus* in *Osceola.* All the species of *Ophibolus* agree in the character assigned.

The *Dromicus flavilatus* Cope, of the S. E. coast regions of the United States, has the penial structure of *Rhadinaea* Cope, and does not belong to *Dromicus.* The organ is undivided, and the calyculate region is capitate. We have here a case parallel to the genus *Liodytes,* of which the type species was supposed to be a *Helicops.* Both these Floridan forms turn out to be allies of types found on the North American continent.

Causus Licht. has the character of other Solenoglypha, *i.e.,* coarsely spinous at the middle, and calyculate above, and deeply bifurcate. In *C. rhombeatus,* the only species examined, there is at the middle of each branch a longitudinal fissure-like interruption of the calyculate structure which contains feeble laminæ on its sides and fundus. The calyces are papillose.

As regards the structure of the lungs, I have to add observations on two species not previously examined. In *Anomalodon madagascariensis* there is no tracheal lung nor auricle of the large left lung. The rudimental right lung measures about 6 mm. In *Psammophis irregularis* the structure is similar in the points mentioned, except that I could not discover a rudimental right lung.

Calotes versicolor Daud.

THE BATRACHIA AND REPTILIA OF THE UNIVERSITY OF PENNSYLVANIA WEST INDIAN EXPEDITION OF 1890 AND 1891.

BY E. D. COPE.

The species enumerated or described in the following pages were collected in the course of a yachting expedition conducted by Professor J. T. Rothrock, at that time Professor of Botany in the University of Pennsylvania, among the northern islands of the West Indies. Collections were made at the following islands of the Bahama group: New Providence, Eleuthera, Watlings Island, Crooked Island, and Great Inagua. They next touched at the eastern point of Jamaica, at Port Morant, and later at Port Luce at the western extremity. The last collections were made at Grand Cayman Island. The zoologist of the expedition was Mr. J. Percy Moore, now Instructor in Comparative Anatomy and Zoology in the University of Pennsylvania. To his care we are indebted for an excellent series of the vertebrata of the islands visited. The collection of Batrachia and Reptilia enumerated in the following pages is one of the best ever made in the region. Collections from Crooked Island and Inagua are especially welcome as but little was previously known of their vertebrate fauna. Mr. Moore has furnished me with notes of his observations, which are added in their places, in quotation marks.

New Providence.

Trachycephalus septentrionalis Tsch.

"This large tree toad was met with abundantly everywhere in the Bahamas and on Grand Cayman. About the sisal plantations on New Providence great numbers could be taken, one or more being concealed beneath the bases of the thick, fleshy leaves of almost every plant. Their cry, when taken in the hand, is very startling, having much of the force, quality, and pitch of the cry of a young infant. They are said to spawn in the wells."

Anolis principalis Linn.

Anolis sagræ D. & B.

"This is one of the most widely distributed and abundant of

Bahaman Anoles. The species is most characteristic of the more northerly islands; of those visited by us they are very abundant on New Providence, fairly swarming on Eleuthera, and less common on the islands south and east. We failed to find this species on Fortune Isl. and Great Inagua. They are equally at home on the ground and in trees, preferring to seek their food on the former. They are very pretty, when raised high on the fore-legs, with head elevated, and body in a quiver of excitement, they pause to detect the movement of an insect, upon which they spring with much agility, and devour in an instant. Their principal food is ants, which they seek along fences, by the roadside, among the trees, and in and about houses. Like the other Anoles they are fond of sunning themselves and lie on stones or fences with the legs stretched lazily along the sides of the body. On the island of Eleuthera, where they are known to the natives by the name of Iquana, they are fond of lying on the branches of bushes overhanging the fresh-water ponds. Outside of the Bahamas *A. sagræ* was met with in Jamaica, where they are particularly abundant on the north shore about Port Lucea."

Anolis distichus Cope.

"Common on New Providence, and less so on Eleuthera. Their habits in general resemble those of *A. sagræ*, but the species is especially common on the ground in banana and sisal plantations."

Anolis oligaspis sp. nov. Plate XI, fig. 5.

Tail little compressed at the base (mostly lost), and with a larger median dorsal row of scales. Scales minute, a few dorsal rows scarcely larger; ventrals much larger, smooth. Tibia about as long as head to posterior border of orbit. Occipital plate oval, larger than ear opening (transversely divided in the single specimen), separated from supraorbitals by one row of scales. The supraorbitals are in contact, and they are continued as a row of two large scales only between the anterior one which borders the orbit, and the scales of the canthus rostralis. The first pair of these two large scales is separated by a single row of small scales; the second is separated by three rows, of which the median is the largest, and continues to between the nares. Thus at the second large scales there are five rows of scales across the muzzle between the canthal scales, of which the lateral and median are larger than the other two. All scales of muzzle without keels; a shallow basin between large rows. Canthal

scales three. Supraoculars forming a disc of seven smooth scales, which is in contact throughout its inner border with the supraorbital series. Loreals in five rows.

The muzzle is rather short, and the extended hind limb reaches to the orbit. There are thirteen laminæ beneath the second and third phalanges of the third and fourth toes.

The only specimen is a female, and it is greenish-gray with a brown band on each side of the vertebral line, which is similar in color to the sides. Throat with longitudinal series of blackish spots.

Length to vent, 44 mm.; do. to line of meatus auditorius, 14 mm. Length of fore limb, 19 mm.; do. of hind limb, 34 mm.; of hind foot, 14 mm.

This species is remarkable for the reduction in the number of its head scales. It resembles no other species nearly, unless it be the *Anolis krugii* Peters, of Porto Rico, which I have not seen. There are numerous discrepancies in the description of the latter. For instance, in *A. krugii*, the ventral scales are keeled, the superciliaries are separated by a row of scales; the supraorbitals are keeled; there are four enlarged dorsal rows, and the color is quite different.

Amiva thoracica Cope.

"A common and conspicuous species, especially in the northernmost of the Bahama Islands. Like its allies this is essentially a ground inhabiting species, living among the loose coral boulders, in the crevices of which secure shelter and concealment may be found. They love to lie on stones basking in the warm sunshine, but are ever alert and dart away like a flash, their course being indicated by a blue streak. They are extremely difficult to catch, and although very abundant on Cat Isl., and almost equally so on Eleuthera, only a very few specimens were taken."

Ungualia maculata D. & B.

Alsophis vudii Cope.

CAT ISLAND.

Alsophis vudii Cope. Port Howe.

ELEUTHERA.

Anolis principalis L. Tarpum Bay.

"A most beautiful species of essentially arboreal habits. Widely distributed, but apparently not very common anywhere. They are found among the smaller trees and bushes, leaping actively about

and performing many interesting acrobatic feats in pursuit of insects. New Providence, Governors Harbour, and Tarpum Bay, Eleuthera, Port Howe, Cat Isl., French Wells, Crooked Isl., and Fortune Isl."

Anolis sagræ D. & B. Tarpum Bay.

Ungualia maculata D. & B. Tarpum Bay.

"This species is common throughout the Bahamas visited by our party, but the *U. cana* was found only on Great Inagua. The species have similar habits. They are found during the day coiled up under stones in the dryest, hottest places with such incompatible company as centipedes, scorpions, and tarantulas, for they are very mild tempered little snakes."

Crooked Island.

Anolis principalis brunneus subsp. nov. Plate X, fig. 3.

This form is allied to *A. principalis*. It has the same shaped head, and the same squamation of the body, with similar proportions of limbs. It falls outside the usual range of variation of *A. principalis* in some points of squamation of the head, and in the color. Thus the supraorbital rows of scales are continued forward, to between the nostrils, not reaching the canthus rostralis, and are in contact throughout, except an occasional separation by a single scale. Thus there are but 4–5 rows across the front instead of 7–8 in *principalis*. There are but three loreal rows, the middle one consisting of but one or two scales, while there are 5–7 in the *A. principalis*. The six or seven supraocular plates are of subequal size and are obscurely keeled, and are in immediate contact with the supraorbitals; in *A. principalis* they are of unequal size and are separated from the supraorbitals by a series of small scales. On the inferior side of the second and third phalanges of the fourth digit of the posterior foot there are 18, 20 lamellæ, in the *A. principalis* there are 24.

The color is different from that of any stage or variety of the *A. principalis*. Above and on the sides leather-brown. On each side two dark brown stripes, the superior the wider, and sending cross processes towards the middle line of the back. Posteriorly it is broken up into a series of dark brown spots which become wider, and finally unite in crossbars on the tail. Below light yellowish, the throat indistinctly lined with darker.

Total length, 123 mm.; do. to vent, 43 mm.; to line of auricular meati, 14 mm.; of fore limb, 15 mm.; of hind limb, 27 mm.; of hind foot, 12 mm.

Liocephalus carinatus Gray.

Scales in 46 rows; 5–6 supraoculars; 3 introfrontonasal scales.

"Generally distributed throughout the Bahamas; this species is especially abundant on Crooked Isl., were Anoles are comparatively uncommon. The larger vegetation is very sparse here and loose piles of coral rock near the shores are overgrown by a comparatively open bush or scrub. It is here that the species abounds, scurrying about on the ground and only rarely climbing into bushes. They are very inquisitive creatures and come close up to look at one, then running back a yard or two, pause again, and raising themselves on the fore-legs, look about with elevated heads, a strange admixture of curiosity and timidity, ready to run again at the slightest alarm. While in running the Anoles only slightly raise the tail from the ground, and the Ameivæ drag it straight out behind, this species elevates the tail high over the back, where it forms, pig-like, a spiral coil, which peculiarity has gained for them the name of curl-tail lizards. This species hides among the rock crevices, and large numbers take advantage of the burrows of the land crab (*Gecarcinus*) as places of concealment. Though active, they are easily caught in the hand, or by means of a grass noose. Their tails part very readily and one is frequently rewarded for his pains with only that squirming member. Highly carnivorous and very voracious they apparently do not pause even at cannibalism, as was illustrated once when a detached tail fell from my hand to the ground, where its movements attracted the attention of an individual of the same species, which ran down from the rocks fully twenty-five feet away, picked up the tail and bore it off. A few minutes later it was seen with the tip of the still squirming tail of its neighbor hanging from between its teeth. On another occasion a warbler which was shot and had fallen to the ground, was found guarded by a large curl-tail which seemed about to attack it."

Great Inagua.

Anolis moorei sp. nov. Plate XI, fig. 4.

Characters those of a prevalent West Indian type, *i.e.*, tail compressed and with a larger median superior row of scales, and ab-

dominal scales smooth. The affinities are with the *A. cybotes* Cope, of San Domingo, but the scales of the sides and most of the back are twice as large, and the median dorsal rows are not abruptly larger than those adjoining. Frontal ridges low, and median basin shallow. Tibia shorter than length from muzzle to ear. Scales of muzzle moderate, smooth. Superciliary rows separated by one row of scales except for a short distance, where they are in contact. Supraoculars 13–15, smooth, those of internal and adjacent rows subequal, the whole separated from the supraorbitals by small scales of different sizes. Occipital plate equal auricular meatus, separated from supraorbitals by three rows. Five loreal rows; four canthal scales, the latter connected with anterior supraorbital by two rather large scales, which are separated by four rows of scales. In front of the basin there are nine rows of scales counting across the muzzle, of which the median row is much enlarged. In *A. cybotes* there are but two or three rows in the frontal basin, and the middle row on the muzzle is not enlarged. Twenty-four lamellæ under the second and third phalanges of posterior fourth toe. Fan of male reaching to between humeri. Male with postanal plates rudimental.

Color ashen, thickly mottled with small, black spots on the sides and back, and upper surfaces of limbs. Spots smaller on nape. A black band from nostril through lower eyelid to ear. Fan greenish-black in alcohol. In a smaller specimen, perhaps a female, as the fan is small, there is a dark band across the supraoculars, and the occiput is reticulated with black. The median dorsal region is covered by a dark brown band.

Total length of male, 195 mm.; do. of head to ear, 10 mm.; do. to vent, 72 mm.; do. of fore limb, 31 mm.; do. of hind limb, 55 mm.; of hind foot, 23 mm.

This species differs from its nearest ally, the *A. cybotes*, in the larger scales, the different arrangement of the muzzle plates, the more numerous supraorbitals, and mostly widely in the coloration. In size it exceeds that species. It is dedicated to my friend Mr. J. Percy Moore, Instructor in Zoology and Comparative Anatomy in the University of Pennsylvania, who captured the type specimens.

"This handsome species was found only on Great Inagua where it is quite common. They are distinguishable at sight, during life, from any species met with elsewhere by their comparatively large size and pale gray-brown spotted color, which on occasion changes to

a more or less intense brown. Though very active in their movements they are readily approached and captured, but have an uncomfortable habit of seeking shelter among the thick clumps of a very spiny Agave."

Anolis cinnamomeus sp. nov. Plate XII, fig. 6.

Tail compressed, with enlarged median dorsal row; ventral scales keeled. A few keeled median dorsal rows nearly equal to ventrals, but soon graduating into the smaller laterals. Caudal scales keeled. Tibia shorter than head to ear; extended hind leg reaching to eye. Fifteen laminæ on second and third joints of posterior fourth toe. Occipital plate equal to auricular meatus, and separated from supraorbitals by three rows of scales. Supraorbitals in contact with each other, the anterior separated from the canthal row by two large scales. Between the latter is a shallow basin containing two series of scales. Three canthal scales. Between them on the front part of the muzzle may be counted seven scales, of which the median is large, being one of a median longitudinal row. Scales of muzzle smooth. Supraocular few, only six large ones and a few small ones at their external border; not, or faintly keeled, and separated from the supraorbitals by a single row of small scales. Five and four rows of loreal scales. The muzzle is of intermediate length.

Color above brown; sides pale brown; inferior surfaces pale. Back, sides and throat speckled with rather coarse black dots, which are on the back rather frequently fused into short lines both longitudinal and transverse. A black spot on the loreal region; the lower eyelid dark. Top of muzzle in front of orbits pale.

Length from muzzle to vent, 45 mm.; to posterior line of ears, 13 mm.; of fore limb, 19 mm.; of hind limb, 24 mm.; of hind foot, 15 mm.

This rather small species is allied to the *A. cybotes* and the *A. moorei*. It agrees with the latter in the character of its scales, but differs from both in the small number of both the supraocular plates, and the subdigital lamellæ, and in the contact of the supraorbital plates, and the reduced number of the scales on the muzzle. It is darker colored than the *A. moorei*, but is similarly speckled with black.

Two specimens were collected by Mr. Moore, which from the small size of their fans I suspect to be females.

Liocephalus sp.

"A distinct *Liocephalus*, probably *L. schreibersii* Gray, was plentiful on Great Inagua, but the specimens have been mislaid. It is a rather smaller, more active species which carries the tail elevated but not curled."

Ungualia cana Cope.

On comparison of this species with others of the genus I have occasion to reassert the distinctness of the *U. hætiana* Cope from the *U. maculata* with which it is united by Boulenger in the Catalogue of Snakes in the British Museum, Vol. I. In the original description (Proceed. Amer. Philos. Soc., 1879, p. 273), the statement is made that the scales are in twenty-seven longitudinal rows, which they are at some points; but at the stoutest part of the body they are in twenty-nine rows. In *U. maculata* they never exceed 25 rows, and are usually 23. There are no interparietal plates; these are always present in the *U. maculata*.

In the genus *Ungualia* the anal claws are of irregular occurrence. In seven specimens before me they are present in only three. The same is true of the genus *Charina*, also usually regarded as peropodous. In two specimens before me they are wanting.

Amiva leucomelas sp. nov. Plate XII, fig. 8.

Ten rows of abdominal scales. Caudal scales oblique, diverging backward and outward on each side of the median series, keeled, the keels parallel to the middle line. Nostril within the border of the internasal plate. Nasal triangular, small; one very large loreal plate; one preocular plate descending to the fourth superior labial; four suborbitals in contact with the labials except the fourth. Six narrow superciliaries; four supraorbitals; frontal not transversely divided. Two parietals on each side of the interparietal, which they do not quite equal in length, while each is about equal in size to the rather elongate interparietal. Two rows of small, smooth postparietals. Gular scales nearly uniform; some larger ones at the middle of the mesoptychium. Dorsal scales coarsely granular, round.

Three rows of plates on the forearm, the external much the widest; one row on the humerus with a much smaller row on each side of it; the former not continuous with the large row of the forearm. Three large and a few small preanal plates, which are continuous with the

abdominals. Femoral pores thirteen. Thirty-four transverse rows on the abdomen.

Median dorsal region brown, becoming blackish and then black anteriorly, the lateral border pale brown posteriorly, but becoming white anteriorly. A broad, black lateral band from orbit to above femur, bounded below by a narrow white stripe. Head brown on sides and above; limbs lead colored above. Inferior surfaces bluish-white; tail with the scales darker at the base than elsewhere. Near the base of the tail the darker color is leaden, but at the middle and beyond it passes to bluish and blue; and the pale portion varies in a corresponding way to pale blue. No black lines on posterior face of femur.

Length to vent, 57 mm.; do. of fore limb from axilla, 16 mm.; do. of hind limb, 35 mm.; of hind foot, 21 mm.

This very handsome species is allied to the *A. polops* Cope of St. Croix, but differs in several respects. The median dorsal scales are not enlarged, as in that species, and there are five fewer femoral pores, and the lateral caudal scales are keeled, not smooth. The coloring is quite different. In the *A. polops* the dorsal region is olive-gray, and there are three white longitudinal lines on each side and a pair of black lines on the posterior face of the femur.

"This handsome species was found only on Great Inagua where they occur very commonly. The colors are very bright during life and this fact, as well as their activity, makes them very pretty objects to watch. Much smaller than *Ameiva thoracica*, which was not found on Inagua, and perhaps even more active, they are extremely difficult to catch, and specimens were only secured by recourse to the shot-gun. They frequent the paths and roadsides and the rocks about the shores."

JAMAICA.

Bufo agua Daud.

"This great toad is very common in the meadows along the streams about Lucea, Jamaica, where they are called frogs. Quite nocturnal in habit they spend the day in burrows beneath stones and rubbish, and at night come forth to splash through the water and rank grass along the shores of streams. When the light from a bulls-eye lantern is flashed on them they crouch and attempt to conceal themselves. In the water they are quite at home and swim easily, but on land progress in a very lumbering way, the legs seeming too weak

to propel the heavy body. Young ones were found concealed under rubbish."

Hylodes martinicensis D. & B.

Port Lucea and Blue Peak.

Lithodytes lentus Cope.

A single example of this handsome black and orange tree-toad was taken at Port Lucea clinging to a shrub overhanging a stream.

Xiphocercus valenciennei D. & B.

Port Morant.

"This fine species was rarely met with and was collected only at Port Morant and Port Antonio, Jamaica. At the former place lizards of all kinds are uncommon owing to the abundance of the mongoose, which animal has exerted a marked influence on the reptilian fauna of Jamaica. Snakes of all kinds have been exterminated so completely that we failed to find a single specimen. The same is true of the larger ground-inhabiting lizards.

The present species lives on and about the trunks of cocoanut trees."

Anolis grahamii Gray.

Port Morant; Port Antonio; Port Lucea.

"Notwithstanding the mongoose, this species is generally abundant about the coast of Jamaica, and on Grand Cayman, though noticeably more so in thickly settled districts, where they are familiarly known as the clucking lizards, and welcomed into houses, over the walls and ceilings of which they run with apparent ease. Their habits were studied about Kingston and elsewhere. At midday in the hot sunshine along fences they are seen at their best. They extend and retract the brilliant scarlet goitre in a regular rhythmical way as a flattened fold, the body meantime passing through a remarkable series of color transitions from rich brown or almost a chocolate color, through pale browns, grays, dull greens to bright blue-greens, some individuals retaining more of one color, some more of another, sometimes plain, sometimes spotted, until one almost wearies in counting the variations and changes. The colors are more or less related at any moment to the colors of surrounding objects. This is a very active lizard which runs with great swiftness along the fences and branches of trees, often taking flying sidelong leaps of surprising length, but clinging surely by means of the adhesive disks, by which they are enabled to cling

even to such smooth surfaces as window panes. At Port Morant they were especially abundant in the cocoanut groves concealing themselves, when alarmed, beneath the matting which envelops the bases of the leaf petioles. Their food, in the vicinity of Kingston, is largely ants and wood ticks."

Anolis flabellatus sp. nov. Plate XII, fig. 7.

Allied to *A. grahamii* but with the abdominal scales smooth, the supraorbital scales continued as a distinct series of larger scales to the canthus rostralis; the scales of the muzzle not keeled. The occipital scale is about as large as the auditory meatus, and it is separated from the supraorbitals by one or two rows of scales instead of four or five as in the *A. grahamii*. Supraorbitals separated by one row of scales; supraorbitals, 13–14 keeled, and of various sizes, becoming smaller externally. The frontal ridges are not elevated as in the *A. lineatopus* Gray, but the front is flat, nearly as in *A. grahamii*. Three scales separate the anterior supraorbital from the canthus rostralis, which itself is marked by five scales. Seven rows on the muzzle between the canthus; ten rows in the *A. grahamii*. Twenty-one lamellæ under third and fourth phalanges of posterior fourth toe. The tibia is shorter than from the muzzle to the ear, and the extended hind foot reaches to the eye. The dorsal and lateral scales are of equal size. The fan is large, extending posterior to the axillæ in males.

Color above brown, lighter on the sides, and marbled on both regions with darker brown. Below pale with darker reticulations on the chin. Color of fan not dark.

Length to vent, 46 mm.; to ear, 13.5; do. of fore limb, 21 mm.; of hind limb, 36 mm.; of hind foot, 15 mm.

This species need only be compared with the *A. grahamii*, to which it is allied. Besides the characters mentioned, it is smaller, and is of a different color; the *A. grahamii* being more or less green, and not tending to brown. It resembles more strongly the *A. grahamii conspersus* of Garman, which is rather intermediate between the *A. flabellatus* and the *A. grahamii*. The *A. g. conspersus* is as large as the latter, and is peculiar in coloration.

From Port Morant and Port Lucea; abundant.

"A slender, pretty species found on the north shore of Jamaica at Port Antonio and Port Lucea. It is not very common, and is found

chiefly among the dense masses of aerial roots which hang from the trunks and branches of the Indian fig (*Ficus indica*), where it drives the would-be collector almost to distraction by quietly slipping into an ever present crevice just as his hand descends on the spot where, in his mental image, it still rests. Its slender form and brown color admirably fit it to its habitat. This species was also found just within the entrance of a cave at Port Antonio."

Anolis sagræ D. & B.

Port Lucea.

Aristelliger præsignis Hallow.

Port Morant.

A small gecko, perhaps the young of this species, was taken by Mr. Moore at Port Morant, about January 12, 1891. Its colors are much more elegant than those of any specimen either adult or young which I have seen, but the scale characters are the same. The color is light fawn, darker on the head; a dark band through the eye; lips whitish spotted. A black scapular spot with a small, yellow center on each side; behind it a delicate vertical yellow line. Narrow vertical yellow lines on the sides, and indistinct brownish dorsal cross-bars behind the middle of the length. Length of head and body 27 mm.

Sphærodactylus goniorhynchus sp. nov.

Lateral and anterior surfaces of rostral plate separated from superior surface by a curved, solid right angle, which is not continued posteriorly. Dorsal scales about equal to ventrals, acute, imbricate, keeled. Scales of top of head similar but smaller. Ventral and pectoral scales similar to dorsal, keeled. Tail covered everywhere with similar scales, whose free apices give it a chaffy appearance. Eyelid covered from middle of front to superior posterior border with large, chaffy scales which are larger than those on the front. Upper part of rostral plate split. Labials $\frac{4}{4}$. Muzzle short, its length from orbit equaling from orbit to auricular meatus.

Color dark marone above, below light reddish-brown, the colors blending on the sides of the body, but separated by a sharp undulating line on each side of the tail. An indistinct, undulating pale line extends from the neck on each side of the back and dorsal surface of the tail, which sends short processes inward, especially on the tail. This line is only clearly seen in the dead animal when it

is in spirits. Gular region paler, uniform. Total length, 43 mm.; length of body and head, 23 mm.

This species is well distinguished by the form of the end of the muzzle, and by the keeled ventral scales. The superciliary scales are also entirely peculiar, as they present several free points upwards and backwards, in place of the spine-like process found in the other species. Port Antonio.

Grand Cayman.

Trachycephalus septentrionalis Tsch.

Anolis grahamii conspersus Garman.

"Very common on Grand Cayman, where they occur in great numbers about the gardens and banana orchards."

Liocephalus varius Garman.

"Found only on Grand Cayman, where it is common among stones by the roadside, and in stone walls. Habits similar to *L. carinatus*."

Aristelliger præsignis Hallow.

"Only one specimen taken on Grand Cayman. It clung so firmly to the tree trunk on which it rested that much of the skin of the bark was torn away in removing it. The habits of this gecko are similar to those described for its allies; while its sluggishness and stupidity distinguish it sharply from the other lizards here described."

Alsophis angulifer caymanus Garman.

"This snake is very common on Grand Cayman, and I recall one stone wall by the roadside that was fairly alive with them. On the top stones many were lying warming in the sunshine, while from crevices everywhere heads protruded. Their movements and general actions resemble what is most familiar in our garter snakes."

EXPLANATION OF PLATES X, XI, AND XII.

Plate X.

Fig. 1. *Holarchus dolleyanus* Cope, about 1.5 natural size.
Fig. 2. *Trimerodytes balteatus* Cope, about 2.5 nat. size.
Fig. 3. *Anolis principalis brunneus* Cope, about 2.5 nat. size.

Plate XI.

Fig. 4. *Anolis moorei* Cope, about 2.5 nat. size.
Fig. 5. *Anolis oligaspis* Cope, about 2.5 nat. size.

Plate XII.

Fig. 6. *Anolis cinnamomeus* Cope, about 2.5 natural size.
Fig. 7. *Anolis flabellatus* Cope, about 2.5 nat. size.
Fig. 8. *Amiva leucomelas* Cope, about 2.5 nat. size.

Lettering.

a, Head, from above; *b*, do. side; *c*, do. below; *d*, scales, from the side; *e*, median dorsal scales; *f*, anal region; *g*, hind leg and anal region; *h*, posterior foot from below.

DECEMBER 4.

The President, GENERAL ISAAC J. WISTAR, in the Chair.

Thirty-three persons present.

A paper entitled "The Sadsbury Steatite," by Theodore D. Rand, was presented for publication.

DECEMBER 11.

The President, GENERAL ISAAC J. WISTAR, in the Chair.

Thirty persons present.

The death of J. Bernard Brinton, M.D., a member, was announced.

DECEMBER 18.

The President, GENERAL ISAAC J. WISTAR, in the Chair.

Thirty-five persons present.

DECEMBER 25.

The President, GENERAL ISAAC J. WISTAR, in the Chair.

Thirty-three persons present.

The Publication Committee reported in favor of publishing a paper entitled "The Osteology of Hyænodon," by Wm. B. Scott, in the Journal of the Academy.

The following was adopted:—

REPORT OF THE COMMITTEE ON THE HAYDEN MEMORIAL GEOLOGICAL AWARD.

The Committee appointed to recommend to the Academy a suitable recipient of the Hayden medal for this year begs leave to report that in examining the claims of the many savants from those countries which have not yet been represented by an award, the attention of your Committee was naturally arrested by Gabriel

Auguste Daubrée, of France, whom it has selected by unanimous vote for the honor.

Your Committee takes great pleasure in recommending that the Hayden Medal of this year be awarded by the Academy of Natural Sciences to Professeur Gabriel Auguste Daubrée, Membre de l'Institut et Grand Officier de la Légion d'Honneur.

Very respectfully,

J. P. Lesley,
Benj. Smith Lyman,
Angelo Heilprin,
Theo. D. Rand,
Persifor Frazer,
Chairman.

Gabriel Auguste Daubrée was born in Metz, June 25, 1814, and is therefore now in his eighty-first year. He graduated from the École Polytechnique in 1834 and immediately received a commission to assist in the geological exploration of Algeria. He was called to the chair of geology in Strasbourg in 1839 and was Dean of its Scientific Faculty in 1852. He was appointed Engineer-in-Chief in 1855. In 1861, upon the death of the distinguished Cordier, he was selected to replace him in the Museum of Natural History, and as Professor of Mineralogy in the École des Mines as well as in the Académie des Sciences in Paris.

He was Director of the École nationale des Mines for a number of years, and while filling this responsible office was invariably courteous and generous in allowing foreigners the privilege of using its collections and library, and in assisting them in all ways to attain what they sought.

His writings have been numerous, original, and important, and it is to his genius and patience that we owe much of our insight into the intricate causes of crystalline structure, and the creation of the branch of experimental geology.

In 1841 he published his "Amas des minerais d'étain," in which a new theory was announced of the origin of the puzzling distribution of tin in its ores. In 1846 he published researches in Norway, and a theory of the occurrence of gold in the Rhine valley.

At intervals he published a long series of memoirs of exceptional originality and interest, among which may be mentioned "Arsenic

in combustible minerals," "Volcanic rocks," "Sea water," "Thermal springs and metallic lodes," "Chemical composition of planetary bodies," and finally, the crown of his labors, "La géologie expérimentale," "Recherches expérimentales sur les forces qui ont du produire le metamorphisme" (1857–1860), and the classic work of recent years "Les eaux souterraines."

He has also published a valuable work "Expériences synthétiques relative aux météorites," and "Classification adoptée par le Musée de l'Histoire Naturelle de Paris."

The following were ordered to be printed:—

A NEW INSECTIVORE FROM THE WHITE RIVER BEDS.

BY W. B. SCOTT.

The American Tertiary formations have yielded a surprisingly scanty insectivorous fauna. Many names have, it is true, been proposed, but for the most part, these names have been given to such fragmentary and uncharacteristic specimens, that they remain mere *nomina nuda*. Only one family, the *Leptictidæ*, is at all well understood, and the ancestors of even the peculiarly American recent types are still quite unknown.

During the past summer Mr. M. S. Farr, of the Chicago University Expedition to the White River bad lands of South Dakota, had the good fortune to discover an insectivorous type new to the American Tertiary fauna, and representing an undescribed genus. For the opportunity of studying and describing this very interesting specimen, I am indebted to the kindness of Professor Baur, to whom I desire to express my very sincere thanks.

The specimen consists of the facial region and mandible, with nearly complete dentition, of a small animal, which upon examination, proves to be a member of the family *Soricidæ*, or shrews, though not altogether agreeing with the definition of that family as usually given. This is the first of the family to be found in any Tertiary horizon of North America.

The genus may be called *Protosorex* and is defined as follows: Maxillary dentition much as in *Sorex*, but with less reduced third molar and smaller internal cusps on last premolar. Mandible with *four* minute teeth between the molars and the large, procumbent incisors. In all other known *Soricidæ* the number of such teeth is *two*, except in one species of *Myosorex*, which sometimes has three.

The species, *P. crassus*, sp. nov., is characterized by the rather short and broad face, vaulted palate, straight alveolar border, and by the relatively large size.

The type specimen is of an individual rather advanced in life, and all the facial sutures have disappeared. The upper surface of the fronto-nasal region is straighter, broader, and more flattened than in the recent species of *Sorex*. The zygomatic arches have already

completely disappeared, the suborbital portion of the maxillary terminating in a rounded surface. The infraorbital foramen is very large and occupies the usual position above $\underline{P^4}$ and $\underline{M^1}$. In advance of $\underline{P^4}$ the muzzle is quite sharply constricted and narrowed. The palate is quite deeply vaulted and concave transversely; between the molars of the two sides it is broad, but narrows rapidly in front of them. No foramina or failures of ossification are visible in the palate. The posterior nares have a similar shape and position to those of *Sorex*, but differ in the raised and thickened front border. The anterior portion of the muzzle is slender and tubular and the narial opening is small and terminal. The horizontal ramus of the mandible is proportionately stout and bears a single conspicuous mental foramen beneath the first molar. Condyle and angle are missing.

In the upper jaw the crowns of the anterior teeth are broken away, leaving only the fangs. The first incisor was large and compressed like that of *Sorex*, but it is impossible to determine whether it had the basal cusp found in that genus. This is followed by four minute, single-fanged teeth, the homologies of which are doubtful. The last premolar is as large as, though much less complicated than a molar; it resembles the corresponding tooth of *Sorex*, but the internal cusp (deuterocone) is relatively less expanded and basin-shaped. The molars have the same construction as in *Sorex;* the last molar is much the smallest of the series, though less reduced than in the modern genus.

The large lower incisor has lost most of its crown, but it would appear to be less entirely procumbent than in *Sorex*. Behind this tooth come four minute and closely crowded teeth, with compressed, chisel-like crowns, of which the first and the fourth are slightly larger and more prominent than the others. As in the upper jaw, the molars are like those of *Sorex*.

Measurements.

Length of upper dental series, exclusive of 1st incisor	M. 0.009
" " molar series	.004
" lower dental series, exclusive of incisor .	.007
" " molar series	.005
Length of palate	.010
Breadth of palate at $\underline{M^2}$	.004

Measurements—(continued).

Breadth of face at orbits		M. .008
" "	$\underline{p3}$	.005
Depth of mandible at	$\underline{m2}$	.0025

Protosorex represents the most primitive type of *Soricidæ* which has yet been discovered, as is shown by the large number of teeth which it has retained. It is, however, not the most ancient form of shrew known, the phosphorites of Quercy, which are as old or older than the White River beds, having yielded species of *Sorex* (*Amphisorex* Filhol). This points to a very high antiquity of the family.

PTERODRILUS, A REMARKABLE DISCODRILID.

BY J. PERCY MOORE.

Among a number of additional new species of Discodrilidæ, which have come into the writer's possession, are two which differ so remarkably from the known type of structure of these interesting parasites that an immediate description of their peculiarities seems desirable. A new genus, *Pterodrilus*, is proposed for them, characterized by the presence on certain of the post-cephalic somites of paired dorsal appendages, chiefly developed from the muscular layers of the body walls. The genus resembles American Discodrilids hitherto described in the presence of a second pair of vasæ deferentiæ in the VIth post-cephalic somite, in addition to the pair in the Vth somite, which alone is present in the European Branchiobdella. Both pairs open to the exterior in the VIth somite by the usual form of efferent apparatus. The dorsal and ventral cuticular jaws are similar to one another, and each is normally bi-laterally symmetrical, though not infrequent variations affecting this symmetry are notable. The external openings of the anterior pair of nephridia are united in a common muscular vesicle having an outlet on the dorsum of somite III.

In the two species at present known the spermatheca is a simple sac with glandular and muscular walls, opening on the ventral middle line of the Vth somite. The atrium shows the usual division into bursa, penis sheath, and glandular atrium, the vasa deferentia opening into the latter, which is short and stout. The ovaries are attached to the posterior face of the septum VI–VII, and the ovipores are situated between the major and minor annuli of somite VII.

As usual in the Discodrilidæ the nervous system consists of a doubly bi-lobulate supra-œsophageal ganglion, united by partly ganglionic circum-œsophageal connectives with the ventral nerve cord, which develops three pairs of deeply bilobed cephalic ganglia, eight pairs of double post-cephalic ganglia, and a posterior nerve mass composed of three fused pairs of double ganglia, making a total of eleven post-cephalic ganglia, corresponding to the eleven bi-annulate body somites.

The vascular system presents the usual supra-intestinal vessel with its anterior portion modified to form a heart, a supra-neural vessel, a peri-enteric blood sinus, four pairs of vascular arches in the head, one pair each in the Ist and VIIth post-cephalic somites, and one pair uniting the longitudinal trunks posteriorly in the IXth and Xth somites. Two pairs of cephalic, and eight or ten of caudal, adhesive glands are present, as well as circum-oral and hypodermal mucous glands. An inconspicuous clitellum is developed on somites VI and VII. No salivary gland, such as is found in *Bdellodrilus illuminatus*, is present.

Regarding the function of the dorsal organs there is little to say. A priori one would expect them to be respiratory, but the apparent entire absence of bloodvessels, which are unrevealed after a careful study of sections, would tend to throw strong doubt upon such an interpretation. Irregular spaces are evident here and there between the muscle fibres, but these appear to be continuous with the intermuscular spaces which are developed between the circular and longitudinal muscle fibres of the body walls, and have not been traced into any communication with the body cavity. Until an opportunity is afforded of studying living examples in their proper habitat, and observing the uses to which these organs are put, no opinion can be vouchsafed.

The two species are of relatively minute size, and were at first regarded as larval stages of another Discodrilid, until sections revealed the presence of perfectly mature spermatozoa and ova, some of which latter were in the course of extrusion through the ovipores.

Pterodrilus alcicornus sp. nov.

Pl. XIII, fig. 1, profile of entire animal, from a mounted specimen about half extended, showing also the course of the alimentary canal, the spermatheca, atrium, and vasa deferentia, the position of the ovary and ovipores of the right side, and the dorsal gland in the VIIIth somite. X 145.

Fig. 1*a*, one of the jaws. X 640.

Fig. 1*b*, transverse section through the anterior part of the VIIIth, post-cephalic somite, passing obliquely into the ventral part of the VIIth; the ovary is cut on one side, and the muscular septum on the other; the intestine and nerve cord are shown; *a*, intermuscular space. X 200.

Fig. 1*c*, a longitudinal section near the median line of the dorsal organ of somite VIII; *a*, intermuscular spaces. X 500.

Fig. 1*d*, section of a terminal portion of a dorsal appendage. X 640.

In this species, which is described from sections and specimens mounted entire, the body is terete throughout, or owing to the increase in thickness of the dorsal walls of the major annuli, appears somewhat compressed at these points. The somites VI, VII, and VIII are of about equal diameter, those anterior and posterior to them tapering respectively toward the head and caudal disk. Bi-annulation of the body somites is very marked. The head is rather slender, and consists of a circum-oral annulus divided into thick entire dorsal and ventral lips, and two similar post-oral rings. The caudal sucker is a muscular disk of simple form, and about the diameter of the Ist post-cephalic somite; its axis coincides with that of the body somites.

Dorsal organs are highly developed in this species on post-cephalic somites III, IV, V, and VIII. Somites VI and VII, and in less degree, II also, exhibit slight dorsal thickenings of the body musculature. On the dorsum of the major annulus of somite III the body walls rise into a high compressed transverse ridge or plate, which fades out on the sides of the somite, and is produced laterally into a conspicuous, forwardly projecting trilobed wing, the anterior division of which flares outward and extends far forward over somite II, usually ending in a slightly bifid expansion. The remaining lobes are simple conical tines, which project upward and slightly outward. The two wings flare so strongly that the distance between their apices is about 1½ times the diameter of the somite. Their shape is very strongly suggestive of the antlers of a young moose, hence the name given to this species. The generic name was also suggested by this species, in which the dorsal organs have a wing-like aspect not seen in the other species.

The dorsal appendage of the VIIIth somite is also highly developed, and similar to the one just described. Its lateral wings, however, are less conspicuous, and are directed posteriorly instead of anteriorly, and also flare outward more conspicuously. The whole organ is strongly concave behind, while that on the IIIrd somite is similarly concave before. A small gland, closely resembling a clitellar gland, is sometimes present (in two out of three series of sections)

embedded in the base of the organ on each side. On the IVth and Vth somites the appendages are less highly developed, but are similar, the low dorsal ridges bearing on each side a pair of slender and simple cylindrical processes.

An examination of figures 1*b*, 1*c*, and 1*d* will make the structure of the characteristic dorsal appendages clear. The transverse dorsal ridges are built up chiefly of short, thick, longitudinal muscle fibres, which extend between the anterior and the posterior covering of hypodermis. Spaces partly filled with a connective tissue network are observable among the fibres, and a similar more extensive space (*a*, figs. 1*b*, 1*c*), separates the muscles of the dorsal organ from the longitudinal muscles of the body walls. A few vertical muscle fibres are also developed in the lateral margins of the ridges. Over this firm muscular basis the hypodermis, with the circular muscle layer, extends, and this alone, with a core of loose, spongy tissue, probably derived from the subdermal connective tissue, forms the terminal processes and lobes, (fig. 1*d*.) In the formation of these dorsal appendages, from the body walls, it would seem that the loose fold of hypodermis and circular muscle fibres that rises freely from the longitudinal muscle fibres is pinched up, as it were, at several points, from which the skin and connective tissue underlying it proliferate to form the marginal processes, while the space remaining becomes filled, save for a few narrow clefts, with muscle fibres that proliferate from the ends of the longitudinal muscle fibres of the body walls at the points where these meet the hypodermis.

The alimentary canal is enlarged to form a saccular stomach in the four anterior body somites, while posteriorly it is narrow and tubular, and, with the exception of a slight transverse loop in the VIIth and VIIIth somites, proceeds directly to the anus on the dorsum of somite X.

The jaws are small, measuring .02 mm. in breadth. They are of similar form, being quadridentate, with a median pair of long, sharply-conical, widely-separated, and divergent teeth, bent at a nearly right angle from the plane of the somewhat quadrangular basal plate. In extreme lateral positions are a pair of inconspicuous blunt teeth. When in position the basal plates are fixed in the cuticle of the pharynx, and the points of the teeth of the two jaws cross in the pharyngeal lumen.

The spermatheca lies in the Vth somite to the left of the intestine.

Its lower half is narrow and cylindrical, its upper abruptly expanded.

The copulatory bursa is rather thin walled, and with the penis is capable of complete invagination. The penis sheath is relatively short, and exhibits no muscular atrial enlargement at the upper end. The glandular atrium is short, nearly spherical, and thick walled. It receives the vasæ deferentiæ, which are of the usual form. In the mounted specimen, from which figure 1 was drawn, the atrium was twisted so that in the figure the anterior end is directed posteriorly.

The common opening of the anterior pair of nephridia is located on the dorsum of the major annulus of somite III, immediately posterior to the dorsal appendage.

The largest examples found among about a dozen specimens measure about 1 mm. in length.

This species was found on *Cambarus acuminatus*, in the Johns River, Watauga Co., N. C., in the summer of 1893; but what part of the crayfish it inhabits was not determined, nor have cocoons been found.

Pterodrilus distichus sp. nov.

Pl. XIII, fig. 2, profile of entire animal, showing intestine, spermatheca, atrium, ovary and ovipore of one side, etc. X 145.

Fig. 2*a*, a jaw. X 640.

Fig. 2*b*, transverse section through the VIIIth somite, showing the dorsal appendages, and the thickening of the body wall, with the intestine, nerve cord, and portion of a nephridium. X 145.

Fig. 2*c*, the male efferent apparatus, figured from a dissection; *a*, glandular atrium; *b*, copulatory bursa; *c*, penis sheath; *d*, bursal glands. X about 200.

Fig. 2*d*, section across the glandular atrium. X 500.

In form this species is similar to *P. alcicornus*, but the head is rather more robust, and the VIIth somite is of greater diameter than VI or VIII.

Dorsal appendages are present on post-cephalic somites II to VIII inclusive, and are much simpler than in *P. alcicornus*. The dorsal ridges are not compressed and plate-like, and are similar on all the somites. On somites II to VII each bears a pair of bluntly pointed cylindrical lateral appendages, while somite VIII bears two pairs; they become somewhat larger anteriorly.

These appendages contain no longitudinal muscle fibres, and the

ridges on which they rest are largely formed, as shown in fig. 2*b*, of a muscular network derived from the circular fibres.

In somites VII and VIII a complete transverse loop is developed on the intestine, which is otherwise as in *P. alcicornus*. The jaws are also very similar, but differ in the shorter median pair of teeth, and the stouter form of the basal plate. These distinctions are exaggerated in the figures owing to the fact that they are represented in slightly different positions, fig. 2*a* being somewhat foreshortened.

The spermatheca is slender and clavate, and regularly tapers from blind end to mouth. It lies to the left of the intestine. The copulatory bursa is nearly spherical, with thin muscular walls, and larger bursal glands than *P. alcicornus*. Its inner surface is thrown into deep ridges, among which the penis lies. The whole structure, when evaginated is shaped not unlike a mushroom, and resembles the corresponding parts of *Bdellodrilus philadelphicus*. The glandular atrium is remarkable in being divided by a deep cleft into two similar lobes, the structure being flattened in a plane perpendicular to this cleft, giving the organ a shape much resembling the conventionalized heart. The penis sheath is short, and lacks a sacular dilation.

The anterior nephridial pore is on the crest of the ridge of the IIIrd somite. In other respects this species resembles *P. alcicornus*.

The largest example (from which the dissection fig. 1*a* was made) from among upwards of fifty specimens measured 1.5 mm. in length, the usual size being about 1 mm.

Some small cocoons which may belong to this species were found attached to the setæ at the bases of the thoracic appendages of the crayfishes from which the specimens were obtained. Unfortunately the animals were not discovered while yet alive.

P. distichus was found in great numbers with *Bdellodrilus philadelphicus*, *B. manus* n. s., and *Branchiobdella instabilia* upon specimens of *Cambarus bartonii*, from western New York, for which I am indebted to the kindness of Mr. Albert E. Lewis.

THE SADSBURY STEATITE.

BY THEODORE D. RAND.

Under this name I purpose describing outcrops of steatitic rocks most conspicuously exposed in West Sadsbury Township, Chester County, Pa., in the adjoining township of Sadsbury, Lancaster Co., and less so in Valley, West Caln and West Brandywine Townships, Chester Co. These, though known to archæologists, seem to have escaped the notice of geologists, though known locally and made use of in the building of lime-kilns, and in the lining of iron furnaces. Long anterior to this use, they were evidently of value to the aborigines, whose tools are still to be found at the outcrops, together with fragments of vessels manufactured by the Indians from the steatite.

My attention was directed to these exposures by Mr. Harry Wilson, of Gum Tree, Chester Co., who had visited the localities in the study of archæology, and who kindly took me to the most prominent outcrops.

North of the Cambrian sandstone, which forms the mass of the prominent North (Chester) Valley Hill, is a peculiar rock, often resembling a pegmatite, often a very feldspathic gneiss or schist, occasionally a hornblende or a mica schist. North of this is a very heavy bedded, hard, highly crystalline gneiss, that recognized in this portion of Pennsylvania as the most ancient gneiss, probably of Laurentian age, identical with that of the Highlands of New Jersey and with that of the ridge which extending southwestward from near Trenton, N. J., to near Willow Grove, and there bifurcating, sends its southerly arm southwestward through Montgomery, Delaware and Chester counties to North Brook, five miles southwest of West Chester, and its northerly through northern Chester County, where it widens greatly. It is this northerly arm which is referred to above. In all its extent the rock is very compact and hard unless decomposed, highly crystalline, rarely, if ever, schistose, except from decomposition, and usually showing the characteristic blue quartz.

On the contrary, the rock next north of the Cambrian sandstone is sometimes schistose, and while often gnesssic, is not nearly so densely crystalline. The quartz is usually colorless or white. The rock varies greatly, though the quartz—orthoclase variety, of coarse texture, is most abundant. While, as a whole, differing from any other gneiss of southeastern Pennsylvania, it is more unlike the ancient gneiss than it is unlike those southeast of the Trenton—North Brook ridge, that is the gneisses of Rogers' first belt, Mr. Hall's Philadelphia and Manayunk schists and gneisses. To the last, as a whole, the resemblance is not close, but the rock of some strata in each bear a resemblance. It is the rock referred to by Dr. Frazer as "a rock of doubtful signification called alternately conglomerate, feldspar porphyry, etc." (C⁴, p. 221.) Although Dr. Frazer in his text differentiates this rock,[1] on the map, it as well as the schists between the Cambrian and the limestone are colored the same as the ancient gneiss, though Dr. Frazer questions whether it is not really lower Cambrian.[2]

At Valley Forge and eastward there is in the same relation to the Cambrian sandstone a coarse conglomerate of pebbles chiefly of bluish and pinkish quartz, which has been referred with little doubt to the lower Cambrian. Could we be sure that this quartz feldspar rock represents the conglomerate, a point would be gained, but inasmuch as they are extremely unlike, although exposed within five or six miles of each other, I think we need proof of their identity. The best exposure is along the west branch of the Brandywine, north of Coatesville, where they dip quite irregularly, but with a prevailing southeast dip of 70° and upwards.

As this rock resembles closely no other southeast of the red sandstone, and occurs, so far as I am aware, only in Chester County and the adjoining county of Lancaster, I propose for it provisionally the name of the Chester County gneiss.

It is in this gneiss that most, if not all, of the outcrops of the Sadsbury steatite occur, and apparently in two lines somewhat irregular.

The easternmost outcrop of the northerly line is on the farm of Mr. Thomas H. Windle,[3] on the left bank of the West Branch of

[1] Second Geol. Surv. Penna., vol. C⁴, pp. 221, 225, 228, 257, 263.
[2] C⁴, pp. 257, 258.
[3] I am under obligations to Mr. Windle for aid in this investigation.

to be. Very close to this are two depressions out of which soapstone is reported to have been quarried. Mr. Wilson informed me that basins of Indian manufacture were found here in comparative abundance.

At the school a public road runs nearly east. Along this, on both sides for a quarter of a mile, and then on the north side the steatitic and serpentine rocks abound, but none were seen certainly in place. With these was much gneissoid rock and rusty quartz, also in loose masses. A mile east of this a large mass of steatite is visible in the road, and I am informed that it occurs a half mile farther east on the Limestone road, the dividing line between the townships of Sadsbury and West Sadsbury.[7]

Between a quarter and a half mile north of the steatite the older gneiss is visible in a road running north between two branches of the Octorara.

The fourth and westernmost of the southerly outcrops is the one which has furnished probably the greatest variety and number of specimens of Indian handiwork, their quarries being still partially visible. It is situated on the farm of George Williams, in Sadsbury Township, Lancaster County, about one mile west of Christiana, and three miles S. 70 W. from the Swan outcrop. The only adjacent rock visible is a feldspathic gneiss of the Chester County variety. This is shown in numerous loose masses in a line nearly northeast from the steatite outcrop. The steatite is strewn in fragments, some of them quite large, over an area of several acres, and there are two places where quarries evidently existed but which have been used as dumping grounds for the adjacent rock. In these, I am informed, the rock in place was exposed.

The steatite from all these localities is much alike, generally schistose, quite soft, though impure and containing a large number of small cavities as if from the weathering out of a contained mineral. No crystalline form was observed in the cavities, they often contain ferric oxide. The particles of talc are usually comparatively large and irregular, making the rock, on a casual inspection, resemble a mica schist more than the talc schists of the Lafayette steatite. The color is usually dull gray, more rarely greenish. Except at the Swan outcrop it is not visibly accompanied by serpentine. At

[7] West Sadsbury was set off from Sadsbury in 1878. The dividing line is the Limestone road, an old Indian trail and an important highway, which is the west line of the borough of Parkesburg.

Christiana it contains garnets, at Brubaker's magnetite, and at Hoofman's altered pyrite. At Hoofman's, in small quantity, is a crypto-crystalline variety, very soft, very pale green, nearly white in color, and resembling the talc schist of Lafayette. At the Swan outcrop chlorite in large folia occurs, also a rock apparently one of the hornblende family changing into steatite or chlorite.

At the Windle outcrop the masses of steatite so closely resemble the adjacent masses of schistose gneiss that one is in doubt until he tests for hardness, and there appears to be a gradation from the very hard to the very soft rock.

I have stated that these outcrops are in the Chester County gneiss, but to this the William Paxson outcrop may be an exception. There is an outcrop of the ancient gneiss to the southwest of it. The exposures do not suffice to indicate much more than its certain existence.

There is one other outcrop of steatite to which my attention was called by Mr. Windle, further north than any of those already mentioned and apparently isolated. It is on the farm of Samuel Holmes, and on the south branch of Birch Run, an affluent of the west branch of the Brandywine, in West Caln Township, Chester Co., and is in the course of the ancient gneiss, which ranges north of the sandstone, north of the Chester County gneiss, in West Caln. As usual the exposure is poor, consisting of but a few loose masses of steatite, with masses of schistose gneiss resembling it in appearance.

Perhaps the most striking feature at all these outcrops, considered in relation to those on the southerly side of the valley is the rarity of serpentine. At all other steatite outcrops in S. E. Pennsylvania of which I have knowledge serpentine rocks abound, and the steatite rocks are subordinate, except perhaps in the Lafayette steatite belt, but in it serpentine is abundant though the steatite predominates. In these outcrops north of the valley, however, serpentine is quite rare, being found at the Swan outcrop only. The resemblance of the steatite to the gneiss found with it is very similar to the occurrence at Chestnut Hill, north of Easton, Pa.,[8] and my observations lead me to the conclusion that the genesis is the same in both instances, the alteration of a gneiss containing probably a large proportion of a magnesian mica, and this perhaps derived from the hornblende, as is certainly the case on the Schuylkill, above Girard Avenue Bridge, Fairmount Park, Philadelphia.

[8] Proc. A. N. S. Phila., Mar. 25, 1890, p. 95.

The following annual reports were read and referred to the Publication Committee:—

REPORT OF THE RECORDING SECRETARY.

The interest in the meetings of the Academy has been well sustained during the past year, and the work of the Publication Committee, the report of which it is customary to include in that of the Recording Secretary, has been of more than the usual importance. The attendance at the meetings has averaged thirty-six. Verbal communications have been made by Messrs. Sharp, Ryder, Dixon, Libbey, Chapman, Cope, Willcox, Wistar, Pilsbry, Holman, Goldsmith, Rand, Mercer, Brinton, Allen, Heilprin, Woolman, A. E. Brown, Ball, Sangree, Eakins, Morsell, McCook, Wilson, Rhoads, Morris, Johnson, Rex, and McFarlane. Such of these communications as have been reported by their authors have been published in the Proceedings.

During the year 192 pages of the Proceedings for 1893 and 376 for 1894, illustrated by 13 plates have been published. The first and second numbers of the tenth volume of the Journal, composed of two elaborate memoirs by Clarence B. Moore on the sand mounds of Florida, and consisting of 246 pages and 33 plates, have also been issued and distributed. Material is now in the hands of the Publication Committee for the completion of the ninth volume, which has been delayed in consequence of the character of Mr. Moore's papers, and it is hoped that the last number will be distributed to subscribers and correspondents early in the spring. There will then remain in the hands of the Committee for the continuation of the tenth volume a memoir on the development of the brain in the Anthropoids, by the late Dr. Andrew J. Parker, and one on the crania of the Sand Mounds of Florida, by Dr. Harrison Allen, the latter to be elaborately illustrated through the liberality of Mr. Clarence B. Moore, to whom the Academy is also indebted for the fine plates accompanying his own communications.

The Manual of Conchology has been continued by the Conchological Section, 482 pages and 79 plates having been published in the two series of which the work consists, while 340 pages and 10 plates of the Entomological News and 344 pages and 8 plates of the Transactions of the American Entomological Society have been issued by the Entomological Section.

Forty-three papers have been presented for publication as follows: Samuel N. Rhoads 7, Edw. D. Cope 4, Wm. B. Scott 3, Thomas Meehan 2, H. A. Pilsbry 2, Witmer Stone 2, Clarence B. Moore 2, A. Ortmann 2, C. H. Merriam 2, T. D. A. Cockerell 2, W. H. Holmes 1, Henry C. Chapman 1, David Starr Jordan 1, H. F. Moore 1, Henry C. Mercer 1, E. Goldsmith 1, Arthur E. Brown 1, Thos. Eakins 1, Harrison Allen 1, G. C. Davis 1, F. C. Baker 1, C. W. Johnson 1, Wm. J. Fox 1, J. B. Ellis and B. M. Everhardt 1, and J. Percy Moore 1. Thirty-eight of these have been reported on favorably for the Proceedings and five for the Journal.

Twenty-nine members and one correspondent have been elected. The deaths of thirteen members and five correspondents have been announced. Nine resignations of membership have been presented and accepted.

Mr. Gavin W. Hart having resigned his position in the Council of the Academy, Dr. C. N. Peirce was elected to fill the vacancy April 3d.

The By-Laws were amended February 27th, by the addition of the following words to Article XIII, of Chapter 5: "Should any Section be dissolved, become extinct, or cease to exist for any cause whatever, all the property and effects of such Section shall be held by the Academy for its own use in such of its departments as it may deem most appropriate, preferring those nearest related to the objects of such Section, except such property or parts thereof as may be subject to conditions or limitations by deed, devise, bequest, or special agreement, in which case such property shall be disposed of in accordance with such condition, limitation, or agreement."

On the report of the Committee on the Hayden Geological Memorial Award the medal and accumulated interest on the fund have this year been voted to Prof. Gabriel Auguste Daubrée of the Institut de France.

By permission of the Academy meetings have been held on the premises during the year by the Geographical Club, the Botanical Club, the Delaware Valley Ornithological Club, Pennsylvania Society for the Prevention of Tuberculosis, Pennsylvania Forestry Association, Woods Holl Biological Association, and the United States Veterinary Medical Association.

During the absence of the Recording Secretary in Europe the duties of the office were acceptably performed by Mr. Wm. J. Fox.

All of which is respectfully submitted.

EDW. J. NOLAN,
Recording Secretary.

REPORT OF THE CORRESPONDING SECRETARY.

The Corresponding Secretary respectfully reports that during the year commencing December 1st, 1893, he has received from eighty-two societies, museums, etc., one hundred and forty-six acknowledgments of the receipt of the publications of the Academy, and from fifty-four societies, editors, etc., sixty-three notices of the forwarding of their own publications to the Academy, together with fifteen applications to exchange publications for reports, etc., asking for missing numbers of the Academy's publications, and one to discontinue the exchange with the Academy. Thirty-eight letters on various subjects have been received and thirteen written. Fifteen circulars and invitations to the Academy to participate in congresses or meetings, have been received and answered.

During the year one correspondent has been elected and notified. The deaths of five correspondents have been reported. Six certificates have been sent to correspondents.

Seven hundred and fifty-six acknowledgments for gifts to the library and one hundred and twenty-eight for gifts to the museum have been forwarded. Respectfully submitted,

BENJ. SHARP,
Corresponding Secretary.

REPORT OF THE LIBRARIAN.

The additions to the library received during the past twelve months have shown a gratifying increase over the accessions of the year before. They number 4,866, consisting of 4,335 pamphlets and parts of periodicals, 475 volumes, 46 maps, and 10 photographs.

They were derived from the following sources:—

Societies,	2,010	W. W. Jefferis,	6
Editors,	998	Geological Survey of Pennsylvania,	6
I. V. Williamson Fund,	671	California State Mining Bureau,	6
General Appropriation,	420	Dr. Benj. Sharp,	5
Authors,	180	Secretary of State, India,	5
United States Dep. of Interior,	78	H. A. Pilsbry,	5
Smithsonian Institution,	56	United States Department of Labor,	4
Hon. D. W. Voorhees,	51	Kew Botanical Garden,	4
United States Department of Agriculture,	45	J. A. Lintner,	3
Geological Survey of Sweden,	33	Pennsylvania State Board of Health,	3
Rev. L. T. Chamberlain,	20	Geological Survey of New Jersey,	2
Pennsylvania State Library,	19	Geological Commission of France,	2
Wilson Fund,	19	United States Coast and Geodetic Survey,	2
United States Department of State,	18	Department of Geology, Indiana,	2
Dr. Samuel G. Dixon,	17	Norwegian Government,	2
United States Treasury Department,	16	Charles E. Smith,	2
Chas. P. Perot,	15	Department of Works, Mexico,	2
Minister of Public Works, France,	12	Costa Rica National Museum,	2
Tennessee State Board of Health,	12	Geological Survey of Minnesota,	2
Colorado Scientific Society,	9	Illinois State Bureau of Labor Statistics,	2
Superintendent of the Census, India,	9	Dr. John Eckfeldt,	2
Geological Survey of Italy,	9	Massachusetts Commissioners of Inland Fisheries,	1
E. L. Gilliams,	9	Maryland State Weather Service,	1
Thomas Meehan,	9	Geological Survey of Georgia,	1
University of Kiel,	8		
United States War Department,	8		
Department of Mines, New South Wales,	8		
Dr. H. C. Chapman,	8		
Geological Survey of India,	6		

Geological Survey of Alabama,	1	Iowa Geological Survey,	1
United States Fish Commission,	1	Mrs. H. Carvill Lewis,	1
United States Civil Service Commission,	1	Angelo Heilprin,	1
Department of Mines, Nova Scotia,	1	East Indian Government,	1
Upsal Observatory,	1	Venezuelan Government,	1
S. R. Roberts,	1	Norwegian Meteorological Institute,	1
Dr. Henry Skinner,	1	Illinois State Board of Agriculture,	1
Dr. M. V. Ball,	1	Dr. H. C. Wood,	1
Directors of City Trusts, Philadelphia,	1	American Humanitarian League,	1
Australian Museum,	1	Comité Météorologique International,	1
		John L. Peyton,	1

They were distributed to the several departments of the library as follows:—

Journals,	3,910	Ornithology,	18
Geology,	234	Agriculture,	15
Botany,	133	Physical Science,	14
Conchology,	113	Encyclopedias,	11
General Natural History,	58	Herpetology,	10
Anthropology,	54	Ichthyology,	9
Entomology,	43	Chemistry,	8
Mammalogy,	28	Helminthology,	7
Anatomy and Physiology,	27	Bibliography,	5
Mineralogy,	22	Geography,	1
Voyages and Travels,	19		

In addition to these, 127 works having no relation to science have been received and catalogued for future disposition by the Library Committee.

The increase in the number of accessions is due to replies received to 258 applications for deficiencies and 62 propositions for exchange of publications. The latter included letters written to all the scientific societies and journals not yet on the Academy's exchange list, the names of which could be ascertained. The results of the correspondence have been encouraging.

The binding has been confined almost entirely to the department of journals and periodicals, 403 volumes having been bound during the year, while 86 volumes are now in the hands of the workmen. Much still remains to be accomplished, although the good results of the last two years' comparatively liberal appropriations for binding are

evident. The volumes are always carefully collated in the Academy before being sent out of the building. The work was interrupted during the summer in consequence of the Librarian's absence in Europe. He took occasion to visit such libraries of scientific societies as could be reached in the cities visited, and is glad to be able to state that no library devoted purely to natural history seen by him was superior either in extent or in convenience of arrangement to that of the Academy.

Perhaps the most important bibliographical aid to the scientific student is the Royal Society Catalogue of Scientific Papers. The ten volumes now issued embrace an alphabetical arrangement of authors with the titles of their contributions from 1800 to 1883. It has long been felt that a catalogue of these papers arranged according to subject was a most important desideratum, but one which must necessarily be the work of co-operation among the scientific societies and bibliographers of the world. Attention was called to the desirability of such a compilation in the report of the Librarian of the Academy for 1889, and it is, therefore, now a cause of congratulation that the subject is under consideration by the Royal Society of London.

A circular having been received from the Society asking for co-operation and suggestion, a committee was appointed consisting of Messrs. Philip P. Calvert, Henry Pilsbry, Stewardson Brown, Benjamin Sharp and Theodore D. Rand, with the Librarian as Chairman, to which the document was referred. A report was adopted by the Academy to the effect:—

1. That a catalogue of scientific papers as proposed by the Royal Society is desirable and that international co-operation should be engaged in its preparation.

2. That in order to secure uniformity in all parts of such a catalogue, a central bureau, as suggested by the Committee of the Royal Society, appears to be necessary, rather than that separate portions of the catalogue should be prepared by various institutions, such central bureau to be under the direction of the Royal Society, from which the proposition emanates; all publications of societies and monographs to be sent to such central bureau; the expenses to be met by returns from the sale of copies of the catalogue.

3. That such a catalogue should be classified and should be issued at least once a year, each volume to be provided with an alphabetical index.

4. That the scope of such a classified catalogue should embrace the various yearly bibliographies of special sciences now issued.

5. That whenever translations or summaries are believed to be desirable, English should be made the basis of the catalogue.

The Academy is indebted to George Vaux, Mary M. Vaux, George Vaux, Jr., and Wm. S. Vaux, Jr., for a fine portrait in oil of the late Wm. S. Vaux, whose long connection with the Academy as Curator, Vice-President, and member of various executive committees for over forty years, together with his permanent association with the mineralogical and archæological departments of the Museum, of which the Wm. S. Vaux Collections form an important part, renders this memorial of unusual interest.

Special acknowledgment is due to Mr. Wm. J. Fox for his efficient and faithful discharge of the duties of the office during the Librarian's absence. Means were again provided by friends of the Academy for the employment during the summer months of Signor Emanuele Fronani, much of whose time was devoted to the correspondence regarding deficiencies and exchanges.

All of which is respectfully submitted.

EDWARD J. NOLAN,
Librarian.

REPORT OF THE CURATORS.

The Curators report that the museum, so far as regards the preservation of the specimens, is in the satisfactory condition described in their last annual report, while important progress has been made during the year in the rearrangement, marking, and cataloguing of the collections.

It is also a satisfaction to report the completion of the new museum building and the transference of some of the collections to the new galleries.

It was deemed most desirable to devote the first floor of the new museum to the departments of Archæology and Mineralogy, and in accordance with this plan the entire Vaux collection, numbering 33 cases, has been transferred under the direction of the Curators and Mr. W. W. Jefferis, the special curator of this collection. Mr. Jefferis has given many valuable minerals to this great collection during the year ; and thanks to his untiring energy the entire cabinet

is now in systematic order. The arrangement of the specimens in the Vaux archæological collection will also soon be completed.

Mr. Clarence B. Moore generously presented six handsome exhibition cases made under the direction of the Curators for the Moore collection of Indian pottery and mound relics from Florida, which have been placed in the new building next to the Vaux collection. Mr. Moore has personally superintended the transference and arrangement of his specimens, which now constitute probably the most valuable archæological series from this region in existence.

The Academy has also purchased four additional cases like those in which the Moore collection is placed, and in these have been arranged the celebrated Poinsett collection of Mexican antiquities deposited by the American Philosophical Society, and the Haldeman Indian collection. In addition to these the cases of Eskimo implements and clothing have been removed to the new building, and numerous spears, shields, kyaks, and canoes have been placed in position on the walls and pillars. In a short time the remainder of the archæological material will be removed to the new building. This floor will then be ready for exhibition.

The archæological department of the museum, as finally arranged, will form one of the finest exhibits in the country, being only surpassed in value by those at Cambridge and Washington. Containing as it does many unique specimens, this department, which for lack of space has been so long neglected, will now be placed in good condition. The Academy's cabinet of minerals will be transferred as soon as suitable cases can be secured. It will be arranged contiguous to the Vaux collection of minerals.

In addition to the transference of these collections to the new building an important rearrangement has been effected in the old museum. Nine cases have been removed to the room over the Lecture Hall, which has been set apart to illustrate the natural history of Pennsylvania and New Jersey. The mammals of these States have been selected from the general collection and many new specimens have been especially prepared for it, while the Delaware Valley Ornithological Club's collection of birds, with nests and eggs mounted to show their life history, has been removed from the ornithological gallery and arranged here to much better advantage. A local collection of reptiles and mollusks has been presented by Messrs. Brown and Stone, while a series of the local lepidoptera is

being prepared for presentation by Dr. Henry Skinner, so that there will soon be an exhibit of the natural history of Pennsylvania and New Jersey much more complete than has heretofore been displayed, and which will constitute a representative State Museum.

Among other work accomplished during the year may be mentioned the rearrangement of the mammalian osteological collection, many of the disarticulated skeletons being placed in drawers where they are more available for study.

The large amount of unclassified palæontological material stored in drawers on the main floor has also been re-examined, roughly classified and labeled, thus greatly facilitating the final disposition of the material.

In cataloguing the museum, important progress has been made, especially in the department of birds, where 5,907 specimens have been carefully examined, identified and catalogued, the types and duplicates unnecessary for display being removed from the stands and placed in cabinets, those desirable for exhibition being remounted. In this work the Curators have followed the practice adopted in all other large museums, and endorsed by letters from the leading ornithologists of the world. A more detailed account of the work of the ornithological department will be found in the report of the Section.

The collection of reptiles and batrachians, numbering 3,939 jars, has also been carefully examined during the year, the jars numbered and a rough catalogue prepared. The entries, however, have not yet been copied into the regular catalogue pending a revision of the identifications.

In the mineralogical department, through the valuable assistance of Mr. J. E. Richardson, the entire collection of over 8,000 specimens has been permanently numbered with painted figures and a considerable portion catalogued. The importance of this work cannot be overestimated, as it will, when completed, preclude all possibility of loss of data by the misplacing of specimens.

The department of invertebrate palæontology has profited by the liberality of the Rev. Dr. L. T. Chamberlain, who has provided a handsome mahogany case for the display of the Isaac Lea collection, and has sent an expedition to the fossil-bearing beds of the Southern States. A rich collection, numbering over 500 species, has been secured, and is now being unpacked and classified. Dr. Chamber-

lain has also generously provided cases for the valuable slabs of fossil foot prints presented by Isaac Lea. During the year Dr. Chamberlain was appointed special conservator of the eocene fossils.

The remainder of the Pennsylvania State Geological Survey collection is also being unpacked and arranged so that all the material will soon be available for study.

During the latter part of last year Dr. Benj. Sharp, in conjunction with Prof. Wm. Libby, Jr., conducted an important expedition to the Hawaiian Islands. As he returned too late to prepare his collections for presentation in time for the last annual report, no mention of them was made at that time. During the past year these collections have been arranged in the museum where they form a valuable addition, comprising many archæological specimens of interest, as well as a fine series of volcanic rocks and lavas, and a series of dried plants.

The Academy's taxidermist, Mr. D. N. McCadden, besides spending much time during the year in remounting the birds, has prepared a large number of new specimens, mainly received in the flesh from the Zoological Society of Philadelphia. These have been mounted for the museum or converted into skins or skeletons as the circumstances warranted.

The accessions during the year have been of great importance. Besides the gifts already mentioned, the Martindale collection of lepidoptera, comprising appoximately 16,000 specimens, was purchased by the Academy with the assistance of a number of generous contributors, and this, together with the Peale and other collections already in its possession, places the Academy in the front rank in this department.

Mr. Clarence B. Moore has continually added to his collection of Indian mound relics, and has had collectors at work in Ohio and Florida during the year. The Zoological Society of Philadelphia presented numerous valuable specimens of mammals and birds, while the Delaware Valley Ornithological Club has added numerous groups to the special collection of local birds and nests.

An important collection of post pliocene fossils has been obtained by Dr. S. G. Dixon and Mr. H. C. Mercer from a fissure in the limestone rocks at Port Kennedy, Pa., where they have made excavations and collected a large amount of valuable data. So far specimens of Megalonyx, Mastodon, Tapir, Peccary, Deer, etc., have

been obtained, full accounts of which will be published in the near future.

The museum during the year has furnished aid to many specialists who have been offered every facility within the power of the Curators, while the interest of the general public in the exhibits would appear to be greatly stimulated. This is largely due to the custom inaugurated during the past year, of placing new and attractive specimens in a prominent place on the main floor of the museum for some days before putting them in their final positions, as well as to many popular articles which have appeared in our daily papers.

Specimens have been loaned during the year to Mr. T. Wayland Vaughan, Dr. Wm. H. Dall, Austin C. Apgar, B. W. Evermann, Prof. Jas. Hall, Messrs. F. W. True, F. M. Chapman, C. W. Richmond, and Dr. Geo. Bauer.

The departments of botany and entomology have been under the care of the special conservators, Mr. John H. Redfield and Dr. Henry Skinner respectively, to whom the Curators are indebted for their valuable aid. Acknowledgment is also due to Mr. W. W. Jefferis, Curator of the Vaux Collections, and Messrs. Shultz, Boyer, and Woolman who have done valuable work in classifying and labeling the collection of diatoms.

The unusual progress thus recorded is largely owing to the earnestness and fidelity manifested by the assistants, Messrs. Witmer Stone and Samuel N. Rhoads, Mr. D. N. McCadden, taxidermist, and the Jessup Fund students, Messrs. J. E. Richardson, Howard Y. Pennell and Henry W. Fowler.

SAMUEL G. DIXON,
Curator-in-charge.

REPORT OF BIOLOGICAL AND MICROSCOPICAL SECTION.

During the year nine regular meetings of the Section have been held, at which communications were made and microscopic slides exhibited.

Among the communications of special interest were those of Dr. B. Sharp, on his expedition to Hawaii and on the fertilization of

plants; those of Dr. Geo. A. Rex, on bacteria in the Myxomycetes; of Mr. Amos P. Brown, on hairs on Mentzelia, and Mr. Boyer's description of a new form of diatom, named by him *Rhabdonema Woolmanii.*

At the joint meetings with the Academy the Section has always been represented by its members, and important communications have been made as follows: John A. Ryder, preparation of nervous tissue, formation of brain convolutions; Geo. A. Rex, M. D., plasmodium of Myxomycetes, Diachœa Thomasii; Benjamin Sharp, PhD., curious growth on a tree-root from San Salvador, fertilization of plants in Hawaii; C. S. Boyer, on cyclosis; Lewis Woolman, remarks on diatoms; S. G. Dixon, M. D., protection from tuberculosis; D. S. Holman, remarks on Myxomycetes; S. Trenner, exhibition of centrifugal machine; M. V. Ball, M. D., remarks on tetanus and the antitoxin, crystals formed by bacteria, skulls of criminals.

The donations to the collection have been few: One slide of barking sand, by Dr. Rex, and ten slides of histologic subjects by Mr. Leedom Sharp.

Five new names have been added to the list of members and contributors. One death has been announced, and two members have resigned, leaving the number of members and contributors sixty-four.

The average attendance at the regular meetings was eight.

The Treasurer's report shows a balance of $239.39 in the treasury.

Dr. Geo. A. Rex, the Conservator of the Section, reports as follows:—

The property of the Section is in good condition. The microscopes and accessory apparatus are in working order and have been freely and frequently used at the stated meeting of the Section.

No addition has been made to the apparatus during the year. The slide collection is also in good order, but it is to be regretted that but few additions have been made since the last report.

Some inconvenience results from the crowded condition of our cabinet, especially in the space devoted to the large binoculars and the Leidy stands, but it is hoped that this will be remedied when space in the new building is available.

The following gentlemen were elected to fill the various offices for the ensuing year:—

Director,	Benjamin Sharp, M.D.
Vice-Director,	John C. Wilson.
Treasurer,	Chas. P. Perot.
Corresponding Secretary,	John G. Rothermel.
Conservator,	Geo. A. Rex, M.D.
Recorder,	M. V. Ball, M.D.

Respectfully submitted.

M. V. Ball,
Recorder.

REPORT OF THE CONCHOLOGICAL SECTION.

During the year 1894 specimens of mollusca have been received from 45 persons, and a large number of species new to the collection have been added to the museum, as well as a few new to science. As usual, a great many specimens illustrating geographic distribution and variation have increased the study series; and as the growth of this series, which is arranged in drawers under the exhibition cases, exceeds the growth of the exhibition series, we are again in urgent need of space for its proper disposal.

The principal accessions during the year have been several sendings from Dr. J. C. Cox of shells from Australia and Tasmania, a large series of marine shells of Japan which we have been allowed to select from the collection of Mr. Frederick Stearns, a series of Japanese land mollusks in alcohol, and a very valuable collection of shells from the Liukiu Is., also due to the liberality of Mr. Stearns. A considerable number of South Australian land shells and chitons we owe to Mr. W. T. Bednall. Finally, the Conservator, with the co-operation of Mr. C. W. Johnson, was enabled to collect very extensive series of the mollusks of the middle St. Johns River, Florida. Many thousand specimens were collected from numerous localities and the material amassed will prove of great importance in the study of the variable and ill-defined species of Floridian Unionidæ. An especial object of the journey was to procure certain peculiar local races of *Vivipara*; and a number of varieties new to science were found, including one of the most divergent forms of the genus yet

discovered in any country, which adds an entirely new phase to the series of variations known in the family Viviparidæ. The success of these researches is attributable to the excellent facilities placed at our disposal by Mr. Clarence B. Moore.

Accessions to our series of American shells have been received from Messrs. A. G. Wetherby, E. G. Vanatta, Morris Schiek, H. F. Stupakoff, H. E. Sargent, C. W. Johnson, O. A. Nylander, S. N. Rhoads, W. J. Raymond, and numerous others, whose names appear in the list of accessions to the museum. A collection of New Jersey shells has been made and presented by Messrs. Witmer Stone, S. and F. H. Brown. It is now arranged in the Pennsylvania and New Jersey department of the museum.

From Prof. H. W. Gwatkin, of Cambridge, England, we have received a large number of mounted radulæ of mollusks, in exchange for material for mounting.

Mr. H. Suter and Prof. F. W. Hutton, of New Zealand, and Mr. C. Hedley, of Sydney, New South Wales, have continued during the year to send us new and rare forms of antipodal mollusks. A series of Sandwich Island forms, collected by Dr. B. Sharp, has added several rare or new species.

Except in the proper placing of new material in the cases, and the determination of new and old material, but little work has been done in the museum during the year; this has been owing partly to the pressure of other work, but mainly to the fact that little can be done advantageously until more space is allotted to the Conchological department. It is believed that this will be accomplished during the coming year.

Respectfully submitted,

H. A. Pilsbry,

Conservator.

REPORT OF THE ENTOMOLOGICAL SECTION.

The regular monthly meetings have been held during the year, except in July and August. The average attendance of members at meetings has been ten persons. Interesting verbal communications on entomological subjects have been made by nearly all the members and associates. The publication known as the Entomological News and Proceedings of the Entomological Section of the Academy of Natural Sciences of Philadelphia, has been continued, and

volume five completed, with three hundred and forty pages and ten plates. One new member has been elected and one associate. At a meeting held Dec. 10, 1894, the following were elected to serve as officers for the coming year:—

Director,	Geo. H. Horn, M.D.
Vice-Director,	Chas. S. Welles.
Recorder,	Henry Skinner, M.D.
Treasurer,	Ezra T. Cresson.
Conservator,	Henry Skinner, M.D.
Publ. Committee,	James H. Ridings, Chas. W. Johnson.

HENRY SKINNER,
Recorder.

REPORT OF THE BOTANICAL SECTION.

The Botanical Section respectfully reports that it is in a prosperous condition, has held regular monthly meetings at which valuable communications have been presented and discussed, and that it is wholly free from debt.

The herbarium, owing to the assiduous labors of the Conservator, Mr. John H. Redfield, is in a highly prosperous condition, containing about 33,000 species of flowering plants and ferns, of which 452 new to the herbarium were added last year.

The herbarium is hampered by want of room, all of which is set forth in detail in the Conservator's annual statement, which is appended as part of this report.

The officers elected for the ensuing year are:—

Director,	Thomas Meehan.
Vice-Director,	Charles E. Smith.
Recorder,	Charles Schäffer M.D.
Cor. Sec'y and Treasurer,	Stewardson Brown
Conservator,	J. H. Redfield.

Respectfully submitted,
THOMAS MEEHAN,
Vice-Director.

The Conservator of the Botanical Section reports as follows:—
This is the nineteenth year since a change of the By-Laws of the

Academy placed the care of its herbarium with the Conservator chosen by the newly formed Botanical Section, instead of with a committee chosen by the Academy as formerly. Certainly the continued and rapid growth of the collection and the improvement of its condition during that period have not been excelled in any portion of the Academy's earlier history. Those who remember the narrow, dark, and cramped accommodations afforded the botanical collections in the old Broad Street building, and the unwieldly portfolios in which they were arranged, under the old Linnæan system, can now congratulate the working botanists upon the improvement in the accessibility and usefulness of the herbarium which resulted from the change of quarters and from more modern methods of arrangement. At the time of that removal, the estimates of the extent of the collection were vague and exaggerated. The careful and conservative enumeration which has since been made of the flowering plants and ferns, places the number of species at the present time at over 33,000. If we add to these the cryptogamic collections, which have not been so carefully enumerated, the total would probably approach 40,000 species. Nearly one-half of these have been received since we have been in the present quarters. But the number of new species received gives a very inadequate idea of the growth, a large part of which consists of additions of species previously represented, but now in fuller suites from new and wider localities, and in better condition.

The collections removed from the old building were all in loose sheets or species-covers, and had consequently suffered much in handling, from the brittleness of age; and many of the subsequent additions were necessarily placed in the same way. But soon after the removal it was determined that it was all-important that the whole should be properly and permanently affixed to sheets with collector's tickets securely preserved. The task was a great one, with the little help at command, but it has been steadily pursued during the time not required for the care of new accessions. The separate North American collection is all thus mounted, and about one-fourth of the larger general herbarium.

The number of plants received during the past year reaches 2,119 species, of which 204 belong to the lower cryptogams and 1,915 are phanerogams and ferns. Of the latter 489 are N. American species, 311 Tropical American, 191 European, 684 Asiatic, 150 African,

and 90 Australian and Polynesian. 452 of these are new to our collection, and 30 of them represent new genera.

It is hoped that the additional space soon to be at command of the Academy will enable the Curators to provide some means for the expansion of the botanical collections. When we took possession of the present cases, large room was left for growth, but nineteen years have crowded the shelves to the point of injury to the contents. If the present shelf room were doubled there would still be very moderate space for that future increase of the herbarium which may be reasonably expected.

The present cases, though so much in advance of previous accommodation do not afford adequate protection from dust, and should be fitted with dust-tight doors, and all new cases should be of the best dust-proof construction.

Respectfully submitted,

JOHN H. REDFIELD,
Conservator.

REPORT OF THE MINERALOGICAL AND GEOLOGICAL SECTION.

Meetings of the Section have been held regularly during the year except during the summer months. The attendance has not been large, but this has been due, in great part, to illness and absence from the city of several active members. There has been no lack of interest. The additions to the museum have been satisfactory.

It is hoped that in the new building space and cases may be provided for a display of the minerals and rocks of the vicinity of our city, for it is believed that the present small and poor local collection could easily be increased so as to be a most valuable and interesting feature of the museum.

The following officers have been elected for the ensuing year:—

Director, ...	Theodore D. Rand.
Vice-Director, ...	W. W. Jefferis.
Conservator, ...	W. W. Jefferis.
Treasurer, ...	John Ford.
Corresponding Secretary, . .	Chas. Schäffer, M.D.
Recorder, ...	Chas. Schäffer, M.D.

Respectfully submitted,

THEO. D. RAND, *Director.*

REPORT OF THE ORNITHOLOGICAL SECTION.

The Section is pleased to report that the Ornithological Department of the Museum is in excellent condition as regards the preservation of the specimens, and to note important progress in the work of renovating the collection on the plans outlined in a previous report.

The question having arisen as to the policy of remounting the type specimens and duplicates unnecessary for display, as has been the custom during the past two years, the Conservator consulted several of the leading ornithologists of the world and obtained their unqualified endorsement of the plans for the renovation of the collection recommended by the Section and adopted by the Curators.

In view of the endorsement of R. Bowdler Sharpe, Robert Ridgway, and other high authorities we feel fully justified in the course we have pursued and are convinced that the proper preservation of our collection of birds is absolutely dependent upon the continuance of the treatment that we have already outlined.

Owing to the miscellaneous duties of the Conservator in his position as Assistant to the Board of Curators, his work on the ornithological collection was mainly restricted to the summer months. At this time, also, the Academy's taxidermist, Mr. David N. McCadden, was enabled to devote his entire time to this department, and with the further valuable assistance of Messrs. Howard Y. Pennell and Henry W. Fowler, it was possible to make greater progress with the work of renovation than in any previous year.

In all 5,907 mounted specimens were examined, catalogued, and labelled, and then remounted or reduced to skins as the circumstances warranted. These included the Ciconiidæ, Gruidæ, Limicolæ, Gallinæ, Columbæ, Dendrocolaptidæ, Formicariidæ, Paridæ, Bucerotidæ, and part of the Fringillidæ. In addition specimens of the Corvidæ, Paradisæidæ, Icteridæ, and Tanagridæ which had previously been catalogued were remounted for exhibition. Several temporary lists were also copied into the regular catalogue during the year aggregating 7,029 entries, while all the accessions have been labelled and placed in the proper places. The entire study series of American birds has been carefully examined and found to be in excellent condition.

The principal accessions during the year have been small collections from Lower California, California, and Florida, received in

exchange or by purchase, and also numerous specimens from the Zoological Society of Philadelphia, among which may be mentioned specimens of *Struthio molybdophanes* and *Dromius irroratus*.

The Delaware Valley Ornithological Club has added many attractive groups to the collection of Pennsylvania and New Jersey birds which is rapidly approaching completion.

At the annual meeting of the Section held December 17, 1894, the following officers were elected:—

Director, ...	Dr. Spencer Trotter.
Vice-Director, ...	Geo. S. Morris.
Recorder, ...	Stewardson Brown.
Secretary, ...	Chas. E. Ridenour.
Treasurer and Conservator, . .	Witmer Stone.

Respectfully submitted,

WITMER STONE,
Conservator.

REPORT OF THE PROFESSOR OF INVERTEBRATE PALEONTOLOGY.

The Professor of Invertebrate Paleontology respectfully reports that, as heretofore, he has delivered his regular spring courses of lectures, twenty-five in number, the attendance at which has been larger than in any previous year. These lectures, embracing in great part the physiographic features of the region about Philadelphia, were supplemented by weekly field parties, and by two special summer class excursions: one to the region of the Shawangunk and Delaware Mountains, the other to the Bermuda Islands. On the first of these excursions the methods of topographical surveying were practically demonstrated in addition to the regular work in geology and paleontology. Two new fossil-bearing localities in the Trias were discovered in the course of the spring excursions.

The collections in the department of Invertebrate Paleontology have not been materially augmented during the year, nor has their condition been very greatly changed. Much has been done toward determining and redetermining unidentified or doubtful forms, and from many specimens hitherto unofficially labelled—*i.e.*, not

named by the author of the species in question—the labels have been removed. In a few cases, too, the authors' labels were found to be incorrect, or at least so doubtful as to necessitate the affixing of an interrogation mark to the identification. The general changes that had been made on the floor of the museum broke into the continuity of the arrangement that formerly existed, and necessitated a considerable reversal in the disposition of the series. An almost full readjustment has been made for the time being, but it cannot be said to meet the actual requirements of the collection. Very nearly double the case-room that the collection now occupies is needed for a proper display of, and to meet additions to, the American fossils alone, and the European collection, which is very disadvantageously stored away in drawers, would occupy about as much space as the American collection occupies at the present time. It is hoped that with the occupation of the Academy's new building the proper relief will be afforded this department.

The additions to the collection during the year are included in the list of accessions to the museum.

Respectfully submitted,

ANGELO HEILPRIN,
Prof. of Invertebrate Paleontology.

REPORT OF THE PROFESSOR OF ETHNOLOGY AND ARCHÆOLOGY.

I have to report that in the early months of the year I delivered a course of lectures on general archæology. They were six in number and were free to the public. The attendance was unusually large, and a general interest was manifested in the subject.

The collections in this department have been increased by valuable accessions, which will be specified in the reports of the Curators. The whole collection is now in process of rearrangement in a favorable location in the new building.

D. G. BRINTON, M.D.,
Professor of Ethnology and Archæology.

REPORT OF THE PROFESSOR OF LOWER INVERTEBRATA.

The Professor of Lower Invertebrata, respectfully reports that during the past year he has delivered lectures on the results of the Hawaiian Expedition.

The additions to the museum during the year have been neither numerous nor important.

Work has been carried on in the carcinological department in relabelling and rearranging specimens. With the help of Dr. A. Ortmann, the Porcellanidæ have been correctly determined and relabelled.

A course of lectures, ten in number, is planned to be delivered sometime during the spring on general zoology.

Respectfully submitted,

BENJ. SHARP,

Professor of Lower Invertebrata.

REPORT OF THE PROFESSOR OF HISTOLOGY AND MICROSCOPIC TECHNOLOGY.

The Professor of Histology and Microscopic Technology respectfully reports that he has conducted less than the usual work in the bacteriological laboratory than in past years, owing to the fact that the greater part of his time has been devoted to his duties as Executive Curator. Some satisfactory work, however, has been accomplished in bacteriological examinations of drinking waters in the State of Pennsylvania, and in continued investigations upon the various lines heretofore suggested for the prevention and cure of tuberculosis and other germ diseases.

Original investigations made during the winter on the relationship between Tuberculosis and Nitrogenous Metabolism have been communicated to the Academy and published in the Therapeutic Gazette for December 15, 1894.

Microscopic examinations have been made of the viscera of animals which have died at the Philadelphia Zoological Gardens.

The bacteriological laboratory has been freely used by members of the Academy who desired the privilege, while the society has not

been called upon directly or indirectly to defray the expenses incurred for equipment or maintenance.

Instruction has been given in the use of the microscope, but no work has been done in histology.

SAMUEL G. DIXON,
Prof. of Histology and Microscopic Technology.

REPORT OF THE CURATOR OF THE WM. S. VAUX COLLECTIONS.

The Curator of the Wm. S. Vaux Collections respectfully reports that the cabinets have been in good condition during the past year. They have, however, been inspected by but few persons, owing to the unfavorable situation of the rooms in which they were arranged. No additions have been made in the archæological section since the donor's death. At the present time it is being removed into the new building where it will attract attention in connection with the collection of Mr. Clarence B. Moore and others belonging to the Academy.

Since the last report 158 specimens have been added to the collection of minerals, several being new species. Their removal into the new building has been completed without loss or injury to any of the specimens. The cabinet has been placed in good order. It has been arranged on the first floor of the new building where, in consequence of the abundance of light, it can be exhibited to advantage.

Respectfully submitted,
WM. W. JEFFERIS,
Curator.

The election of Officers, Councillors, and Members of the Finance Committee to serve during 1895, was held with the following result:—

President,	General Isaac J. Wistar.
Vice-Presidents,	Thomas Meehan.
	Rev. Henry C. McCook, D.D.
Recording Secretary,	Edward J. Nolan, M.D.
Corresponding Secretary,	Benjamin Sharp, M.D.
Treasurer,	George Vaux, Jr.
Librarian,	Edward J. Nolan, M.D.
Curators,	W. S. W. Ruschenberger, M.D.
	Henry C. Chapman, M.D.
	Samuel G. Dixon, M.D.
	Arthur Erwin Brown.
Councillors to serve three years,	Charles P. Perot.
	Dr. C. Newlin Peirce.
	Theodore D. Rand.
	George H. Horn, M.D.
Finance Committee,	Charles Morris.
	Charles E. Smith.
	Uselma C. Smith.
	William Sellers.
	Charles P. Perot.

ELECTIONS DURING 1894.

MEMBERS.

January 30.—William S. Vaux, Jr., Edward K. Tryon, Jr., Dr. Gustavo Niederlein, Milton J. Greenman, M.D., Frank J. Keely, J. Lewis Crew.

February 27.—Ruth Clement, M.D., W. Graham Tyler.

March 27.—Theodore N. Ely.

April 24.—A. B. Van der Wielen, Rev. Leander Trowbridge Chamberlain, D.D., Charles G. Macey, J. W. Parker.

May 29.—Theodore Presser, William J. Fox, Andrew J. Downs, M.D., George E. Kirkpatrick, Henry P. Dixon.

June 26.—Harris A. Slocum, M.D., Thomas S. Parvin, John N. Hussey.

October 30.—Horace Binder.

November 27.—J. Carroll McCaffrey, William L. Whitaker.

CORRESPONDENT.

June 26.—Anstruther Davidson, of Los Angeles, Cal.

ADDITIONS TO THE MUSEUM.

1894.

ARCHÆOLOGY, ETHNOLOGY, ETC.

Rev. L. T. Chamberlain. Stone idol, Mexico.
Dr. S. G. Dixon. Casts of Mexican vase and idol.
Mrs. M. N. Frederick. Mortar and pestle, Argentine Republic.
Clarence B. Moore. Two aboriginal American crania, New York.
Dr. Geo. A. Rex. Stone axe, Philadelphia.
S. N. Rhoads. Aboriginal knee ornament, Colorado.
Dr. Benj. Sharp. A collection of Hawaiian implements, fifty-five specimens and two trays.

MAMMALS.

A. E. Brown. Skin of *Ursus cinnamomeus*.
Mrs. G. W. Carpenter. Teeth and jaw of *Physeter macrocephalus*.
Dr. H. C. Chapman. Disarticulated skeleton of *Sus scrofa* L. Cast of brain of *Cynocephalus* sp.
Prof. E. D. Cope. *Perognathus copei* (type), Texas. Skull of *Bison bison*. *Adelonycteris fuscus*, Missouri.
Dr. S. G. Dixon. Skeleton of Eskimo dog (*Canis familiaris*).
F. L. Garrison. Mounted Caribou head.
Wm. Justice. Three skins *Evotomys*, Adirondacks.
D. N. McCadden. One disarticulated skeleton *Tatusia novemcincta*.
Peary Relief Expedition. Twenty mammal skulls.
Zoological Society of Philadelphia. Mounted specimens of *Felis tigris*, *Bison bison* (juv.), *Macacus ochreatus*, *Capreolus capreolus*, *Erethizon dorsatus*, *Tapirus* sp., *Dasyproca acouchy*, *Felis eyra*.
Skins of *Sciurus* sp. (Java), *Nandinia binotata*, *Felis caracal*, *Cercopithecus albogularis*, *Felis eyra*, *F. yagouaroundi*, *Galago garnettii*, *Midas rufimanus*.
Skeletons of *Ursus cinnamomeus*, *Canis familiaris*, *Felis leo*, *Camelus dromedarius*, *Cervus porcinus*, *Felis tigris*, *F. eyra*, *F. yagouaroundi*, *F. caracal*, *Erethizon dorsatus*, and two others.
Skulls of *Sciurus* sp., *Nandinia binotata*, *Felis eyra*, and two others.
Alcoholic specimens of *Lemur varius* (viscera), *Felis concolor* (juv.), *Macacus* sp. (fœtus), *Galago garnettii*.
H. A. Pilsbry. Two skulls and three alcoholic specimens, Florida.
S. N. Rhoads. Four specimens *Condylura cristata*, Me. Two specimens *Blarina talpoides*, Haddonfield, N. J. One jar *Adelonycteris*

fuscus, Tarpon Springs, Fla. Twelve skins and skulls and two alcoholic specimens, Waynesburg, Greene Co., Pa.

Dr. W. S. W. Ruschenberger. One skull of *Canis familiaris*.

H. E. Sargent. Ten jars mammals.

J. Shulze. One skull *Lutra hudsonica*, Monroe Co., Pa. One skeleton of *Lutra hudsonica*, Monroe Co., Pa.

Wagner Institute, in exchange. Skins of *Bassariscus*, *Neotoma*, and *Aplodontia*, Oregon.

Dr. W. L. Zuill. Skeleton of *Equus burchelli*.

Purchased. Mounted specimens *Putorius erminea*, Bergen Co., N. J. *Erethizon dorsatus* and *Lutra hudsonica*, Potter Co., Pa. One hundred and twenty-two skins, California (collected by R. B. Herron).

Birds.

Geo. B. Benners. *Dendroica chrysoparia*, Comal Co., Texas. *Ceryle torquata*, Laredo Co., Tex.

Mrs. G. W. Carpenter. Skull of *Struthio camelus*.

C. S. Hebard. *Anas cyanoptera*, Florida.

Mrs. A. D. Hockley. Egg of *Struthio camelus*.

J. S. and W. H. Jenks, and Mrs. R. W. Randolph. *Haliætus leucocephalus*, *Grus mexicanus*.

Zoological Society of Philadelphia. Mounted specimens of *Gracula intermedia*, *Casuarius australis*, *Dromaius irroratus*, *Struthio molybdophanes*.

Skins of *Lorius domicella*, *Cygnus nigricollis*, *Plectolophus nasica*, *Chrysolophus amherstiæ*, *Ortalida albiventris* (3), *Colinus cristatus*, *Phasianus torquatus*, *Conurus acuticaudatus*, *Eulabeia indica*, *Amblyrhamphus holosericeus*, *Tadorna tadorna*, *Clophaga magellanica*, and two others.

Skulls and sterna of *Anhinga anhinga*, *Milvus ictinus*, and five others.

One skeleton.

Delaware Valley Ornithological Club. Fifteen mounted specimens.

S. N. Rhoads. *Dryobates borealis* (juv.), Florida. *Polioptila cærulea*, Waynesburg, Pa. *Podylimbus podiceps*, Pike Co., Pa.

B. H. Vandecker, Jr. Forty-five skins from Guatemala.

Purchased. *Aythya americana*, Flamingo. Seventy-eight California skins collected by R. B. Herron.

By purchase and exchange. Forty-five skins from California, Florida, and Connecticut.

Reptiles and Batrachians.

A. P., S., and F. H. Brown and W. Stone. Thirty-three jars reptiles and batrachians from Pennsylvania and New Jersey.

E. D. Cope. Thirty-seven jars from Oklahoma, Texas, and Indiana.

H. C. Chapman, M.D. Three skulls.

Dr. S. G. Dixon. *Eumeces pentalineatus*, Md. Seven jars reptiles, Maine.
J. Fannin. *Gerrhonotus garnettii*, Victoria, B. C.
Dr. W. E. Hughes. Three jars, Canada.
Howard Y. Pennell. One jar, Pa.
Zoological Society of Philadelphia. *Hyla maxima*, *Iguana tuberculata*, *Testudo tabulata*, skin of *Megalobatrachus maximus*, and thirty-six jars, including a number of types.
S. N. Rhoads. *Chrysemys picta*, N. J. Fifty-four jars, Penna.
H. E. Sargent. One jar.
Harold Sharp. *Anolis principalis*.
Graham Spencer. Skin of *Crotalus adamanteus*.
F. Stearns. Three mounted turtles, Liu Kiu Isl.
Purchased. *Daboia russellii*, *Naja haje*, casts of *Megalobatrachus maximus*, *Iguana tuberculata*.

Fishes.

J. R. Moore. *Salmo blakistoni*, Yezzo, Japan.
D. N. McCadden. *Cottus viscosus*, Port Kennedy, Pa.
L. Woolman. One jar, *Mustelus canis*.
C. D. Clark. *Remora*, Bay Head, N. J.

Crustacea.

Mrs. I. C. Martindale. Two *Limulus polyphemus*.
S. N. Rhoads. One jar *Cambarus*, Greene Co., Pa.

Echini, Worms, Corals, etc.

F. Stearns. *Gorgonia*, Liu Kiu Isl.

Recent Mollusca.

Edwin A. Barber. One tray *Littorina irrorata* from Longport, N. J.
W. T. Bednall. Forty-one trays of South Australian mollusks, including types of several Chitons.
F. C. Blanes. Four trays and five bottles of mollusks from Cuba.
S. and F. H. Brown and Witmer Stone. Ninety-six trays mollusks from Cape May, Pt. Pleasant, Atlantic City, etc., etc., in N. J.
F. Burns. One tray *Anodonta fluviatilis* from Washington, D. C.
Mrs. G. W. Carpenter. One tray of *Unio nicklinianus* Lea from Candalaria Lake, Mexico.
G. H. Clapp. One tray of *Polygyra hirsuta* from Edgeworth, Pa., and one of *Eulota fasciola* from China.
W. B. Clark. One tray *Latirus subrostrata* from Columbia.
M. Cossmann, in exch. One tray *Planorbis Rollandi* from Algeria.

Conchological Section. *Columbarium pagoda*, *Ischnochiton tigrinus* and types of *I. Elizabethensis*. (Purchased.)

Dr. J. C. Cox. Seventy-two trays and six bottles of mollusca from Australia.

W. W. Dall. Eight trays of mollusks from Bahamas.

W. H. DeCamp. One tray of *Polygyra plagioglossa* from Mexico.

Mrs. H. E. Dwight. Eight trays of West Indian mollusks.

Dr. L. F. Flick. Pearl from *Ostræa virginica*.

John Ford, Fourteen trays of mollusks.

Jas. Green. Eight trays of mollusks from Vicksburg, Miss.

Chas. Hedley. One tray of *Gundlachia petterdi* from S. Australia.

Heilprin Expedition. *Bulla occidentalis* from Mexico.

J. B. Henderson. One tray and eighteen bottles of land mollusks from Jamaica.

Mrs. A. Hockley. One *Tridacna gigas*.

Geo. C. Hubbard. *Pupa holzingeri* from St. Cloud, Minn.

Dr. W. E. Hughes. *Polygyra dentifera* from Lac aux Sables, Prov. Q., Canada.

Prof. F. W. Hutton. *Helcioniscus flavus*, *Patella kermadecensis*, and *Chiton canaliculatus* from New Zealand.

J. E. Ives. *Littorina litorea* and *Purpura lapillus* from Gloucester, Mass.

W. W. Jefferis. One tray *Unio complanatus* from Hudson River, N. Y.

C. W. Johnson. One tray *Actæon punctostriatus* from Micco, Indian River, Fla. *Bulla adansoni* from Corsico, W. Africa.

H. Lemon. *Aplysia* cast up at Cape May, N. J.

Geo. Lichtenthaler coll. Two trays of marine mollusks.

W. L. Lockington. One tray *Trachydermon raymondi*.

Geo. T. Marston. *Valvata sincera* from Madison, Wis.

J. R. Mead. *Anodonta beatei* and *Unio parvus* from Panther Creek, Kingman Co., Kas.

Miss K. Musson. One tray *Polygyra thyroides*, Ashbourne Heights, Pa.

C. J. Newcombe. Eleven trays of mollusks from Victoria, B. C.

H. A. Pilsbry. *Helix fultoni* from Khasi Hills, India. *Chiton discolor* from New Caledonia. *Ancylus parallelus* from Lebanon Springs, N. Y., and *Polygyra multilineata* from Iowa City, Iowa. *Unio trapezoides* from Ark.

H. A. Pilsbry and J. E. Ives. Four trays of mollusca from Pa., Ind., and W. Va.

Purchased. *Argonauta argo*, Palm Beach, south of Lake Worth, Florida.

W. J. Raymond. Three trays *Trachydermon raymondi* from California. Types.

S. N. Rhoads. Twenty-eight trays and nine bottles of mollusca from Greene Co., Pa. *Vitræa arborea* from Sea Girt N. J.

John Ritchie, Jr. Specimens of *Gibbula richardi*, *Monodonta lugubris*, and *Philomycus carolinensis*.

E. W. Roper. Types of *Bulla roperiana* and tray of *B. striata* from the Balearic Isles. Type of *Patella kermadecensis* from Kermadec Isls.

H. E. Sargent. Seventeen trays of mollusks from Alabama.

M. Schiek. One tray and one bottle of *Helix alauda* from Cuba.

Ida M. Shepard. Collection of Californian shells in exchange.

Dr. H. Skinner. *Littorina irrorata ;* one tray from Anglesea, N. J.

Dr. H. A. Slocum. Collection of mollusks from raised beach in Sweden.

Fr. Stearns. Thirty-five trays of mollusks from Japan ; one bottle of *Bulla gouldiana* from Coronado, Cal.

L. H. Strang. *Nassa exilis* from Panama ; *Goniobasis alabamensis* from Ala.

S. Stupakoff. Six trays mollusks from Pa. and Ill.

H. Suter. One tray *Gundlachia woodsi* from River Avon, and one bottle of *Plaxiphora terminalis* from N. Zealand ; nine trays land shells from N. Zealand.

E. G. Vanatta. Twenty-two trays of mollusks.

H. A. Van Nostrand. Five trays of mollusks from Japan, presented through S. R. Roberts.

Geo. W. Webster. *Strobilops hubbardi* from Lake Helen, Fla.

A. G. Wetherby. Numerous shells from North Carolina, Kentucky and Tennessee, including one of the original lot of *Polygyra wetherbyi* Bld.

Louis Woolman. One tray *Unio complanatus* from Harrisonville, N. J; *Chyrsodomus stimpsoni* from Nantucket.

G. W. Wright. *Odostomia tacteu* from Auckland, New Zealand.

Vertebrate Fossils.

E. D. Cope. Eleven species fossil vertebrata (7 types), Kansas, Oklahoma, and Dakota, Cope Expedition, 1893.

H. C. Mercer. Earth and fossil bones from Hartman's Cave, Pa.

Invertebrate Fossils.

H. C. Borden. Fossils from Lenola, N. J.

Dr. H. C. McCook. Three ammonites.

Dr. H. A. Slocum. Three trays *Orthoceras*, Sweden.

Lewis Woolman. Cretaceous fossils from Lenola, N. J.

Plants.

Prof. Benjamin Sharp. Sixty-nine species of Hawaiian plants; also five photographic views of the same.

Dr. J. Bernard Brinton. Sixty species of plants, collected on Merritt's Island, Florida, by A. A. Baldwin, in 1893.

Alexander McElwee. *Zinnia grandiflora* and *Pinus edulis*, from New Mexico. *Cassia tora* and *Sesbania macrocarpa*, introduced near Lansdowne, Phila., and brought to notice by Prof. Macfarlane.

Prof. José N. Rovirosa. Thirty-six species of ferns from Chiapas, Mexico.

I. C. Hatch. *Cupressus macrocarpa*, from Monterey, Cala. (Monterey Cypress), *Araucaria excelsa*, and *Quercus suber* (Cork Oak), cultivated at Santa Cruz, Cal., also section of a young tree of the latter.

Mrs. Ross Lewers. *Pyrola rotundifolia* var. *bracteata*, *Pyrola aphylla*, *Heuchera micrantha*, *Woodsia Oregana*, and *Pellæa Bridgesii*, from Reno Co., Nevada.

Dr. Charles Schæffer. Hough's Sections of N. American woods, Parts IV and V.

William Trimble (through Dr. Schæffer). Specimens of double walnuts, from Concordville, Pa.

Joseph Walton. *Chimonanthus fragrans*, both in flower and in leaf: a native of Japan, cultivated near Philadelphia.

Prof. F. L. Scribner. *Hieracium Scribneri* and *Carex Austro-Carolinensis*, from Tennessee.

Prof. C. S. Sargent. Photographic copy of a likeness of Stephen Elliott, botanist.

Baron Ferdinand von Müller (through Thos. Meehan). Twenty-two species of Australian plants.

Herbarium of Harvard University. Six hundred and forty-nine species of plants collected by the Schlagenweit brothers in Thibet, and in the Himalayas, in 1856. Fifty-one species collected in Nyassaland, Africa, by J. Buchanan, in 1891. Fifteen species collected in Dominica, W. I., by Ramage, and thirty-six species collected by Beardslee and Koford, mostly in North Carolina.

Mrs. Susanna M. Gaskell. Double flowers of *Anemone Hepatica*, from Swarthmore, Pa.

J. B. Ellis. Thirty-first and thirty-second Centuries of North American Fungi, named and arranged by Ellis and Everhart.

Frederick Stearns. *Polyporus* (species), from Loo Choo Islands.

J. Dolores Salaverria (through Prof. Sharp). Curious abnormal growth of wood, from El Progres, San Salvador, Central America.

Roberts Le Boutillier. *Alpinia nutans* and eight species of tropical orchids cultivated by him.

F. V. Coville, of U. S. Department of Agriculture, Division of Botany. One hundred and thirty-seven species of plants collected by the Death Valley Expedition in 1891.

J. A. Crabtree. *Viola rotundifolia*, from Wissahickon, Phila.

Andrew Steinemann. Curious fastigiate and spiral stem of *Asparagus officinalis*.

Mrs. Katharine Brandegee. Series of Californian *Ceanothi*, illustrative of her "Studies in Ceanothus," consisting of thirteen species and twenty-four varieties or forms, in all eighty-seven sheets.

Mrs. Fanny E. Briggs. Seven species plants from State of Washington.

Dr. Lawrence Turnbull. Branch of oak with remarkable glomerate clusters of galls.

Benjamin H. Smith. Forty-seven species of plants collected by him in Colorado, New Mexico, and California.

W. W. Jefferis. Fifteen species of plants collected by him near Fort Edward, N. Y., also seed vessel of *Nelumbium luteum*, cultivated at Saratoga Springs.

W. Tell, Austin, Texas (through Thos. Meehan). *Ipomœa pandurata* and *Acalypha radians*, from Austin, Texas.

B. G. Onderdonk, Texas (through Thos. Meehan). *Antigonon cordatum*, native of Mexico, cultivated in Texas.

Knut Bachlund. One hundred and ninety species of Scandinavian plants, collected by himself and others.

Geo. E. Osterhout (through Thos. Meehan). Abnormal form (without spurs) of *Aquilegia cærulea*, from Colorado.

T. Chalkley Palmer. *Isoetes saccharata*, from Elk River, Maryland.

Prof. Thos. C. Porter. Seventeen species of plants from eastern Pennsylvania.

Thomas Meehan. Ninety-eight species of South African plants, collected by Schlechter. Thirty-three species of exotic plants, mostly from cultivation. Thirty-six species of North American plants.

John H. Redfield. Two hundred and fifty species of plants collected by C. G. Pringle, in Jalisco, Mexico, in 1893. One hundred and nineteen species of North American plants from J. H. Sandberg's Botanical Exchange, Minneapolis.

Edward L. Rand and John H. Redfield. Thirty-seven species of plants from Mount Desert, Maine, and neighboring islands, continuing a series representing the Flora of that region.

Minerals and Rocks.

C. C. Bartlett. Staurolite and Garnet, N. H.

Mrs. G. W. Carpenter. Two hundred and ninety-four trays minerals.

E. D. Cope. Calcite, Fort Supply, Oklahoma.

Copper Queen Mining Co. Malachite, Azurite, Cuprite and Copper, Arizona.

E. A. Groth. Dolomite, Pa. Orthoclase, Beryl, Phila.

T. J. Lewis. Two specimens.

Thos. Nelson. One specimen.

Jas. W. Pearce. Orthoclase, Pa.

Mrs. J. W. Queen. Basaltic column, Ireland.
T. D. Rand. Sixteen specimens.
J. E. Richardson. Enstatite, Bamle, Norway.
Dr. B. Sharp. Sixteen trays lava, one tray Chrysolite, Hawaii.
S. Tyson. Two trays.
Purchased for Vaux collection. Two hundred and eighteen trays.

MISCELLANEOUS.

J. Beaumont. Nests and alcoholic specimens of termites.
Dr. Wm. Camac. Nests of termites.
Rev. H. C. McCook. Wood bored by carpenter ants.
W. W. Jefferis. Hornet's nest.
Miss M. E. Lyndall. Malformed egg of common fowl.
J. M. Whelen. Barometer.
Women's Silk Culture Association. Six jars silk and cocoons.

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PROCEEDINGS

OF THE

ACADEMY OF NATURAL SCIENCES

OF

PHILADELPHIA.

1894.

COMMITTEE ON PUBLICATION.

JOHN H. REDFIELD, EDWARD J. NOLAN, M.D.,
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PHILADELPHIA:
ACADEMY OF NATURAL SCIENCES,
LOGAN SQUARE.
1895.

ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA,
January 30, 1895.

I hereby certify that printed copies of the Proceedings of the Academy for 1894 have been presented at the meetings of the Academy as follows:—

Pages	9 to 24	April 24, 1894.
"	25 to 56	May 1, 1894.
"	57 to 88	May 29, 1894.
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"	385 to 416	January 8, 1895.
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EDWARD J. NOLAN,
Recording Secretary.

LEVYTYPE CO., PRINTERS AND ENGRAVERS, PHILA.

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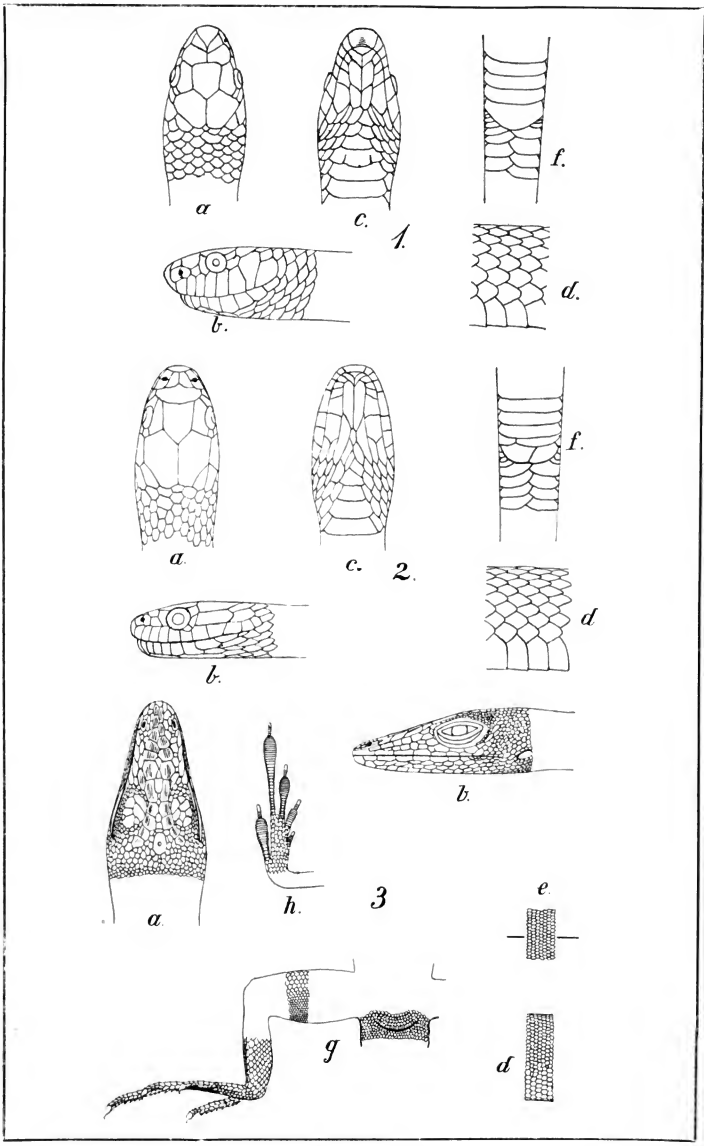
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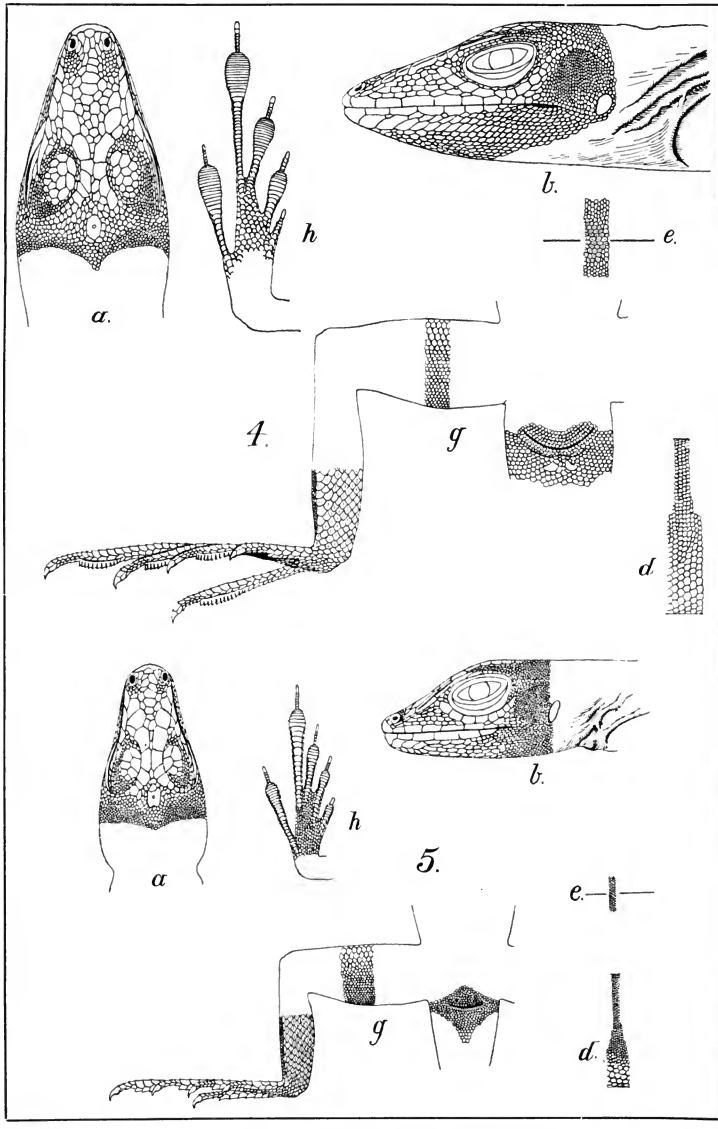
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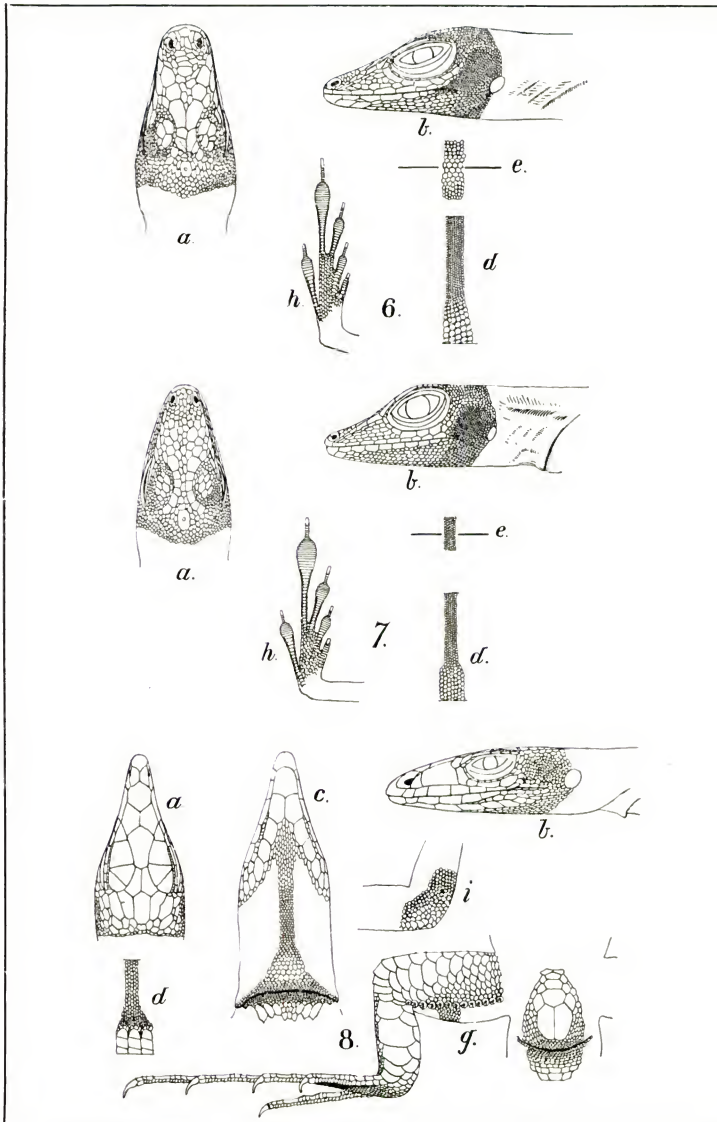
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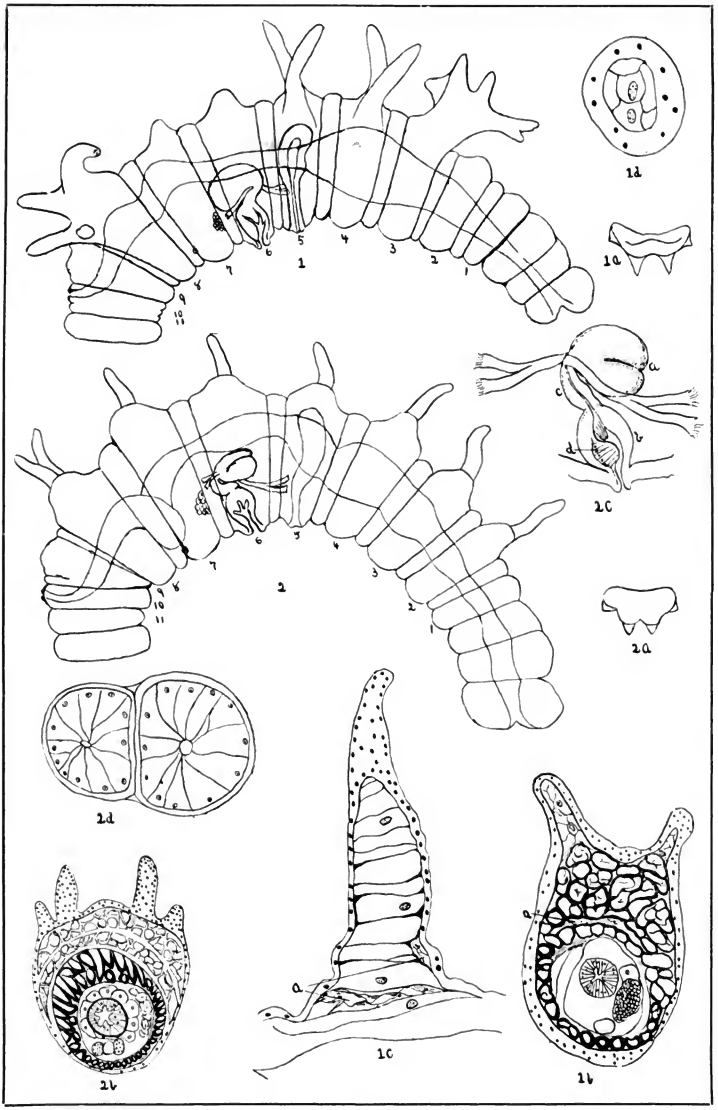
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MOORE ON PTERODRILUS.

Hayden Memorial Geological Fund.

Mrs. Emma W. Hayden has given to the Academy of Natural Sciences of Philadelphia in trust the sum of $2,500 to be known as the Hayden Memorial Geological Fund, in commemoration of her husband, the late Prof. Ferdinand V. Hayden, M. D., LL. D. According to the terms of the trust, a bronze medal and the balance of the interest arising from the fund are to be awarded annually for the best publication, exploration, discovery or research in the sciences of geology and paleontology, or in such particular branches thereof as may be designated. The award and all matters connected therewith are to be determined by a committee to be selected in an appropriate manner by the Academy. The recognition is not confined to American naturalists.

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ISBN 978-1-4379-5447-0

